# Collaborative Partnerships for Childhood Obesity Prevention: Trends and Correlates Nationally and a Case Study in Minnesota

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**Abstract**

Obesity affects nearly one in five children in the United States and costs billions of dollars to manage and treat. National advisors and funding agencies are increasingly encouraging multiple sectors of society to work together on childhood obesity prevention, yet the extent to which states are adopting and succeeding with this approach is unknown. In this dissertation, I address this gap in the literature using national surveillance data and a mixed methods case study in Minnesota. In study 1, I examined secular trends and state-level political, social, and economic conditions associated with collaboration on school nutrition and physical education (PE) activities nationally. Collaboration increased between 2000 and 2006 and decreased or stabilized between 2006 and 2012. The number of organizational collaborators in 2012 was higher in states with higher childhood obesity prevalence, higher poverty, higher public health funding, and a state-level PE coordinator. In study 2, I examined the prevalence of evidence-based state policies on competitive foods and PE between 2006 and 2012. Findings from generalized linear models indicate that strong state policies were unrelated to measures of collaboration and significantly positively associated with childhood obesity and state-level measures of socioeconomic disadvantage in 2012. In study 3, I used mixed methods to develop a theoretically informed process to identify and describe the roles of key stakeholders in a Safe Routes to School (SRTS) partnership in Minnesota. The Minnesota partnership was successful in implementing SRTS programs in nearly 200 communities and advocating for policy change to expand and institutionalize SRTS in the state. Findings indicate that contributors to success of sophisticated partnerships may differ across multiple geographic levels and core partnership functions. Overall, the findings from this dissertation suggest that collaborative partnerships are common and under some circumstances, such as SRTS in Minnesota, may contribute to adoption and/or implementation of policies to prevent childhood obesity.

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## Background and Specific Aims

*Epidemiology of Childhood Obesity*

Nearly one in three children age 2-19 in the United States is overweight or obese.[1] Obese youth are at greater risk of hypertension, high cholesterol, type 2 diabetes, bone and joint problems, sleep apnea, and psychosocial distress than their normal weight peers.[2-4] Obesity during childhood and adolescence also tracks into adulthood,[5,6] increasing the risk of long-term health consequences such as heart disease, metabolic syndrome, non-alcoholic fatty liver disease, gall bladder disease, osteoarthritis, and many types of cancer.[7,8] Based on current trends, treating and managing obesity and associated chronic health problems will cost the U.S. an additional $48-66 billion per year in medical costs by 2030.[9]

The causes of obesity are multifaceted and include interactions between biological, behavioral, and environmental factors. Social-ecological models conceptualize these different factors as nested layers of influence,[10-12] while complex systems models attempt to identify causal relationships and feedback loops between the factors.[13,14] These models underpin the obesity prevention activities and recommendations of the Centers for Disease Control and Prevention (CDC) and the Health and Medicine Division (HMD) of the National Academies (formerly the Institute of Medicine). Current recommendations argue for multi-level strategies to develop environments and policies that support healthy eating and physical activity across a range of settings, including schools, worksites, communities, and health care.[15,16]

Policy and systems-level approaches are necessary to address complex public health challenges such as obesity. Interventions targeting these outer levels of the social-ecological model have the widest reach because policies and systems have the capacity to affect many more people than programmatic interventions, which only reach individuals who participate. Furthermore, behavioral interventions that promote healthy eating, physical activity, and weight gain prevention through individually focused strategies have produced small, short-term effects,[17] demonstrating the difficulty of behavior change in the absence of supportive environments.[18] In contrast, policy and systems interventions

have the potential to create lasting change by targeting the root causes of obesity—the conditions in the social, physical, and policy environments that lead to unhealthy behaviors and weight gain.

*Public Policy Efforts to Prevent and Control Childhood Obesity*

In the past decade thousands of new state laws have been introduced or enacted that address a wide range of topics intended to change food and physical activity environments in schools and communities. The vast majority of these laws have addressed school settings, including farm-to-school programs, school food service policies, school health and nutrition curricula, physical education curricula and requirements, and physical activity and recess.[19-21] These policy changes, together with a broad social movement that has raised awareness, engaged grassroots efforts, and initiated clinical practice change regarding childhood obesity prevention, may be beginning to pay off: After a steady increase in the prevalence of childhood obesity over the past three decades, recent data indicate that this trend is leveling off.[1] Some groups, including younger children and those living in states and localities with comprehensive obesity prevention initiatives, are even beginning to show declines in obesity prevalence.[1,22-26] While these statistics are encouraging, many questions remain about the impact of policy changes on obesity and the most effective way to achieve those changes.

Research on the causal relationship between policy change and obesity and related behaviors has not kept pace with the rapid adoption of new laws and policies, in large part due to the difficulty and expense of conducting such studies.[27] National recommendations have been based on the best available evidence, as opposed to the best possible evidence, and research and policy recommendations have developed in tandem with policy and practice changes at the local, state, and national levels.[28]

Emphasis on School Settings

Most state legislative activity on obesity prevention in the past decade has focused on policies designed to change school environments, policies, and practices for the promotion of healthy dietary and physical activity behaviors.[28] Primary and secondary schools are an important setting for childhood obesity prevention because 95 percent of

school-aged youth are enrolled in school, and students spend a significant amount of time and consume a significant portion of their daily calories in school.[29] Targeting children for obesity prevention also has the potential to yield long-term health and economic benefits by establishing healthy behaviors that may last a lifetime. Differences in state laws' timing, scope, and strength (e.g., whether laws require specific changes or recommend general action) provide a natural experiment to evaluate the impact of policies on student behavior and weight, making schools one of the most well-studied settings for policy impact evaluations.[30]

A recent review of state and district competitive food and beverage policies (e.g., foods and beverages sold outside of federal meals programs) concluded that there is strong empirical support for the positive influence of competitive food and beverage policies on reducing in-school availability/access and in-school consumption of unhealthy foods and beverages, and weaker support for the impact of these policies on overall student consumption and student weight status.[31] This conclusion is not surprising given that schools are just one environment in which students spend time. Several more recent multi-state studies of state school nutrition policies found greater fruit and vegetable consumption among students in states with laws requiring fruits and vegetables in school meals[32] and smaller differences in BMI percentile between students who participated in free/reduced price school lunch and those who did not in states with school meal standards that exceeded USDA standards.[33] A national also study found that students in states with weak competitive food laws (e.g., nonspecific recommendations) had higher odds of obesity compared to students in states with strong laws or no laws.[34]

Studies have also linked state policies targeting physical education and physical activity to greater physical education attendance,[35] time spent being physically active,[35,36] walking behavior,[36] and use of active modes of transportation to and from school.[36] One study also found that state laws requiring more minutes of physical education time reduced the probability of obesity among 5$^{th}$ graders,[37] while others have found no association between state policies and body mass index change.[35]

Overall, the literature on the impact of school obesity prevention policies suggests that policies can be effective at changing school environments and practices, which in

some cases may lead to improvements in student behaviors and weight outcomes. Policies can have diverse impacts depending on the strength of the policy wording (e.g., how specific or stringent the requirements are)[34,35,38] and the policy topic, with competitive food and beverage policies and policies increasing mandated physical education showing the most promising results.[31,36,37,39] However, cross-sectional studies have also found evidence of greater policy activity in states with higher prevalence of childhood obesity. The authors of these studies suggest that this may be because policymakers are responding more forcefully in states where childhood obesity is a larger threat to children's health.[34,40,41]

Focus on The Policy Process

Research on the policy process is an important complement to research on the impact of policy changes on obesity and related behaviors. This research addresses questions such as how to most effectively achieve policy change and how policy development and implementation are related to health impacts. A prime example of the need for this type of research is the widespread collaboration across multiple sectors of society, including public agencies, non-profit organizations, academic researchers, healthcare professionals, private businesses, and community members, on childhood obesity prevention.[13,15,42,43] Little public health research has examined the characteristics of effective collaboration on childhood obesity and whether collaboration leads to more effective or sustainable systems-level changes, including policy changes. Yet, examples of collaboration on obesity prevention abound, and are often explicitly encouraged by federal funding agencies, including state partnerships funded by CDC's Nutrition, Physical Activity, and Obesity (NPAO) programs,[44,45] the Safe Routes to School National Partnership,[46] the Convergence Partnership,[47] and First Lady Michelle Obama's *Let's Move* campaign.[48]

Evidence available to date suggests that collaboration can improve community capacity to make systems-level changes for obesity prevention,[49-52] increase adoption of obesity-related policies,[45,53] and improve implementation of obesity-related policies and practices in schools and communities.[45,54] However, some researchers and advocates

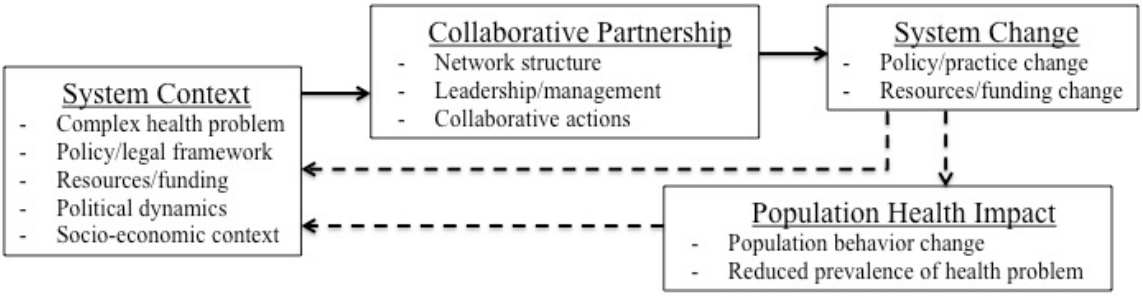
caution against collaborating with the food industry on childhood obesity prevention, citing concerns regarding real or perceived conflicts of interest and failed past attempts to work collaboratively.[18,55] A recent HMD workshop on public-private partnerships in food and nutrition concluded that major risks of partnering with industry to achieve public health goals include threatening the integrity of public institutions and the integrity of science and eroding public trust in those institutions.[56] The workshop participants suggested that in some situations the benefits of increased knowledge exchange could outweigh those risks, and that establishing "rules of engagement" could assist in mitigating the risks. More research on the impacts of collaborative partnerships for childhood obesity prevention would contribute to the evidence base by identifying the conditions under which collaboration may lead to more robust and sustainable policy and environmental changes.

*Conceptualizing Collaboration*

One reason public health researchers have paid relatively little attention to the theory and practice of collaboration may be that scholarship on collaboration is found mostly in other disciplines, such as political science, public affairs, network research, and sociology.[48,57] Consistent with the public health literature, *collaborative partnerships* are defined here as groups of organizations from different sectors (e.g., public agencies, community-based organizations, private businesses, etc.) working together to achieve a shared goal.[58] Other authors and disciplines refer to these groups as multi-sector partnerships,[59] community coalitions,[60] public-private partnerships,[61] cross-sector collaborations,[62] organizational networks,[63] and collaborative governance regimes.[64]

Conceptual frameworks on collaboration generally share the goal of explaining why collaborative partnerships develop, how they function, and what outcomes they achieve. Figure 1 summarizes the conceptual framework used by this study, which is based on consolidated conceptual models from public affairs and network research disciplines that have been applied to public health problems and contexts.[48,59,60,64-66] Solid lines refer to relationships that were directly examined by this dissertation; dashed lines refer to proposed effects that are outside the scope of this study.

**Figure 1. Conceptual Framework of Collaboration for Public Health Systems Change**




The core elements presented in Figure 1 are remarkably similar across frameworks: (1) contextual factors (e.g., political environment, funding availability, urgency to address a complex health problem) influence when, where, and why collaborative partnerships develop;[59,60,64] (2) the structure of the partnership as a network (e.g., breadth, density, centrality, and connectivity of members) and the partnership's leadership and management strategies (e.g., decision making procedures, communication, resource sharing, trust building) affect its actions and outcomes;[48,59,60,64-66] and (3) outcomes of collaborative partnerships include systems-level changes in policy, practice, and environments.[48,59,60,64,65] These outcomes in turn change the system context from which the partnership arose, creating a feedback loop,[59,64] and lead to improvements in population health.[48,60,65]

The structural features of collaborative partnerships are hypothesized to affect the management and activities of the partnership. Mays et al. developed a typology of public health partnership configurations that vary across three structural dimensions commonly found in network research: breadth (the diversity of actors participating in the partnership), density (the interconnectedness of partnership members), and centrality (the relative importance of individual actors in the partnership).[66,67] Greater breadth may indicate more mature collaborative partnerships, which may be better able to combine the knowledge and resources of participating organizations and support a broader and more comprehensive range of public health activities.[66,68] However, too large or diverse of a network can make consensus, decision-making, and interaction more difficult.[59,66,68] A few carefully selected partners with diverse and relevant expertise may yield similar results with lower time and resource costs.

Population wide behavior change and health improvements happen slowly over time, and there is limited evidence directly linking collaborative partnerships to population behavior and health improvements. The strongest evidence available comes from a review by Roussos and Fawcett of 34 published studies on local community partnerships, defined as "alliance[s] of different people and organizations working to improve a health-related condition at the community level."[46] The review found that 10 studies demonstrated improvements in population health indicators that could potentially be attributed to the activities of the partnerships. These include a 43% reduction in incidence of childhood lead poisoning in the four years following development of a coalition in New York City; a 50% reduction in infant mortality among African Americans in Boston in the two years after a partnership initiative began; a significant reduction in adolescent pregnancy incidence in a South Carolina community with a School/Community Adolescent Pregnancy Prevention Partnership (relative to control communities), with replicated results in three communities in Kansas; and a 10% annual reduction in alcohol-involved crashes in intervention communities within two years of the Community Trials Project. However, most studies employed a case study design, making it difficult to attribute these changes directly to the partnership. In addition, 12 of the 15 studies that evaluated the impact of collaborative partnerships on population-wide behavior change (as opposed to health outcomes) demonstrated improvements in behavior (e.g., alcohol, tobacco, illicit drug use; physical activity; safe sexual practices). Findings from two of the larger studies (the National Cancer Institute's Community Intervention Trial for Smoking Cessation (COMMIT) and the U.S. Center for Substance Abuse Prevention observational study of a random sample of 24 communities with collaborative partnerships) concluded that improvements in population health behaviors could be attributed to the partnerships but that the magnitude of effects was small.[46] These studies compared the results of collaborative partnership activities to control sites with no health promotion activities. The question of whether a collaborative partnership can produce superior results to a non-collaborative health promotion effort (e.g., single sector or traditional bureaucratic approach) remains a gap in the literature.

The conceptual framework in Figure 1 identifies systems change as the primary

outcome of collaborative partnerships and the mechanism by which partnerships impact population health. The review by Roussos and Fawcett found that program, policy, and practice change are often associated with the work of collaborative partnerships, but the ability to draw causal conclusions from existing studies is limited by weak study designs that cannot rule out confounding factors.[46] Thus, the impact of collaboration on population health outcomes remains primarily a theoretical assertion. Qualitative and quantitative research on the context, activities, and outcomes of collaborative partnerships is needed to better understand the strengths and weaknesses of this approach and its relationship to policy change.

*Specific Aims*

I used a mixed methods design to examine cross-sector obesity prevention partnerships in three studies. The specific aims of these studies were:

Study 1. Identify secular trends and state-level political, social, and economic conditions associated with collaboration on school nutrition and physical education activities

Using national data from numerous sources, I examined how organizational participation in state-level collaborative partnerships evolved from 2000—2012 and identified the political, social, and economic conditions associated with state-level partnership breadth in 2012. My hypotheses were that breadth would increase over time as collaborative partnerships matured and that breadth would vary across political, social, and economic characteristics of states.

Study 2. Examine the prevalence of evidence-based state competitive foods and physical education policies and state-level correlates of these policies

Using national data, I examined change in evidence-based state policies between 2006 and 2012 and associations between policy strength and statewide collaboration on school nutrition and physical education activities with specific types of organizations, state-level childhood obesity prevalence, socio-economic indicators, and public health funding levels in 2012. My hypotheses were that collaboration with more types of state-

level school health staff and non-profit organizations would be positively associated with strong state policies in 2012, while collaboration with businesses would be negatively associated with strong policies. Greater childhood obesity prevalence, socio-economic disadvantage, and public health funding were also hypothesized to be positively associated with strong state policies.

Study 3. Describe the structures and processes of a statewide collaborative partnership in Minnesota working to adopt and implement a state-funded Safe Routes to School initiative

I used mixed methods to develop a theoretically informed process to identify and define the roles of key stakeholders in the partnership (e.g., lead organizations versus member organizations, and from all sectors represented by the partnership) to describe the structure and processes of the partnership and to examine whether key informants' reports of partnership processes differed based on their role in the partnership.

## Secondary Data Sources

Six publicly available datasets were obtained to align data from all 50 states and the District of Columbia across multiple years. Table 1 describes the sources of secondary data and the variables used in this study.

**Table 1. Description of Secondary Data Sources and Variables**

| Data Source | Variable(s) | Description | Years | | |
|---|---|---|---|---|---|
| | | | **2000** | **2006** | **2012** |
| School Health Policies and Practices Study (SHPPS) | Food service/ nutrition collaboration *(Study 1: primary outcome, Study 2: primary predictor)* | Yes/no questions assessed whether state-level nutrition or food service staff worked with public, private, and non-profit entities on school food service or nutrition activities during past 12 months | 1/1999-8/2000 (n=8) | 1/2005-10/2006 (n=13) | 10/2010-3/2012 (n=13) |
| | Physical activity/ education collaboration *(Study 1: primary outcome, Study 2: primary predictor)* | Yes/no questions assessed whether state-level physical education staff worked with public, private, and non-profit entities on physical education activities during past 12 months | (n=10) | (n=13) | (n=13) |
| | Food service coordinator *(covariate)* | Yes/no question asks whether someone in the state oversees or coordinates food service for schools, for example a state food service director or director of child nutrition | | | |
| | Physical education coordinator *(covariate)* | Yes/no question asks whether someone in the state oversees or coordinates physical education | | | |
| Classification of Laws Associated with School Students (CLASS) | School Nutrition Environment State Policy Classification System *(Study 2: primary outcome)* | Ordinal scores of 0-6 measure strength of state laws on competitive foods and (separately) beverages in three school locations and three grade levels | | 2006 (n=18) | 2012 (n=18) |
| | Physical Education-Related State Policy Classification System *(Study 2: primary outcome)* | Ordinal scores of 0-5 measure strength of state law on physical education time requirements across three grade levels | | (n=3) | (n=3) |

| Data Source | Variable(s) | Description | Years | | |
|---|---|---|---|---|---|
| | | | 2000 | 2006 | 2012 |
| National Survey of Children's Health (NSCH) | Child and adolescent obesity prevalence *(covariate)* | Percent of youth age 10-17 with BMI ≥ 95th percentile | | | 2011-2012 |
| American Community Survey (ACS) | Percent non-Hispanic white *(covariate)* | Percent of individuals reporting non-Hispanic white race/ethnicity | | | 2013 (3-year average centered on 2012) |
| | Poverty rate: all ages *(covariate)* | Percent of individuals below poverty line | | | |
| | Educational attainment: High school diploma *(covariate)* | Percent of individuals age ≥25 with a high school diploma (or equivalent) | | | 2013 (3-year average centered on 2012) |
| University of Kentucky Center for Poverty Research (UKCPR) | Unemployment rate *(covariate)* | Annual average of percent of labor force unemployed; computed by Bureau of Labor Statistics | | | 2011 |
| | Political affiliation of governor *(covariate)* | Equals 1 if Democrat; collected by Council of State Governments | | | 2011-2012 session |
| | Majority party in state legislature *(covariate)* | Democratic control of one or both houses; collected by Council of State Governments | | | |
| Trust for America's Health (TFAH) | CDC funding *(covariate)* | Total CDC funding ($) | | | Fiscal Year 2011-2012 |
| | Public health budget *(covariate)* | State public health funding appropriations ($) | | | |

*School Health Policies and Practices Study (SHPPS)*

The School Health Policies and Practices Study is a national survey administered periodically by the CDC that assesses school health policies and practices at the state, district, school, and classroom level. Based on a Coordinated School Health framework, the SHPPS survey addresses the following eight interrelated components: health education, physical education and physical activity, health services, mental health and social services, nutrition services and the school nutrition environment, healthy and safe school environment, faculty and staff health promotion, and family and community involvement.[69] The goal of Coordinated School Health is to leverage the central role of schools in children's lives to promote physical, emotional, social, and educational

development by integrating health education, health promotion, disease prevention and access to health services at school sites.[70]

Studies 1 and 2 use the nutrition services and physical education questionnaires of the state surveys conducted in 2000, 2006, and 2012 to measure collaboration at the state level. CDC sent the questionnaires to contacts in state departments of education and health, who were asked to identify the most knowledgeable state officials to respond to each questionnaire.[69] Respondents to the nutrition services questionnaire included state-level directors, commissioners, and consultants for school nutrition services. Respondents to the physical education questionnaire included state-level directors, specialists, and consultants for health and physical education. In the nutrition services survey questionnaire, a series of yes/no questions asked about collaboration between state-level child nutrition or food service staff and other public (state agencies), private (businesses and industry groups), non-profit (professional organizations, advocacy groups), and academic (colleges and universities) partners on school food service or nutrition activities. A similar series of questions in the physical education questionnaire asked about collaboration on physical education activities. Table 2 lists the questions found in each questionnaire across survey years. The surveys also asked whether there was an individual who coordinated food service or physical education activities at the state level.

Survey methods were similar across years with a few notable differences. Data collection took place over the course of eight (2000), ten (2006), or six (2012) months. The 2012 survey used web-based questionnaires whereas the previous surveys used paper-and-pencil mailed questionnaires and computer-assisted telephone interviewing (CATI); in all years the questionnaires were completed by state-level personnel most familiar with school health policies and practices.[69] There were also changes to the questionnaire items. In the 2006 survey, five questions were added to the nutrition services module and three questions were added to the physical education module (denoted as empty boxes in the 2000 column of Table 2). All 50 states and the District of Columbia responded to the surveys in all three years.

**Table 2. Collaboration Variables in the School Health Policies and Practices Study, 2000-2012**

| **Variable** During the past 12 months, have state-level *(child nutrition or food service OR physical education)* staff worked on *(school food service or nutrition OR physical education)* activities with staff *(or members)* from… | **2000** | | **2006/ 2012** | |
|---|---|---|---|---|
| **Public/Government Agencies** | **Nutrition** | **PE** | **Nutrition** | **PE** |
| **School Nutrition/Physical Education** | | | | |
| State-level nutrition or food service | *n.a.* | ☑ | *n.a.* | ☑ |
| State-level physical education | ☑ | *n.a.* | ☑ | *n.a.* |
| **Other School Health** | | | | |
| State-level school health services | ☑ | ☑ | ☑ | ☑ |
| State-level school health education | ☑ | ☑ | ☑ | ☑ |
| State-level school mental health or social services | ☑ | ☑ | ☑ | ☑ |
| **Non-Health** | | | | |
| State parks or recreation department | *n.a.* | ☑ | *n.a.* | ☑ |
| State department of agriculture | □ | *n.a.* | ☑ | *n.a.* |
| **Private** | | | | |
| Businesses | ☑ | ☑ | ☑ | ☑ |
| Food commodity organization, such as the Dairy Council or state produce growers association | ☑ | *n.a.* | ☑ | *n.a.* |
| **Non-profit** | | | | |
| **Academic** | | | | |
| Colleges or universities | ☑ | ☑ | ☑ | ☑ |
| **Advocacy/Implementation** | | | | |
| State-level health organization, such as the American Heart Association or the American Cancer Society | ☑ | ☑ | ☑ | ☑ |
| Governor's Council on Physical Fitness and Sports | *n.a.* | ☑ | *n.a.* | ☑ |
| Action for Healthy Kids | □ | □ | ☑ | ☑ |
| **Professional Organizations** | | | | |
| State-level AAHPERD (now SHAPE) | *n.a.* | ☑ | *n.a.* | ☑ |
| State-level school nurses' association | □ | □ | ☑ | ☑ |
| State-level physicians' organization, such as the American Academy of Pediatrics | □ | □ | ☑ | ☑ |
| State-level School Nutrition Association | □ | *n.a.* | ☑ | *n.a.* |
| **TOTAL** | **8** | **10** | **13** | **13** |

*Note: PE is Physical Education; AAHPERD is American Alliance for Health, Physical Education, Recreation and Dance; SHAPE is Society of Health And Physical Educators.*
*"n.a." indicates question was not applicable to nutrition or PE questionnaire.*
*Empty box indicates that question was applicable to that questionnaire but was not asked on the 2000 survey.*

A major strength of the SHPPS is the availability of data collected from knowledgeable state personnel in all 50 states and the District of Columbia at multiple points in time. However, staff turnover may have resulted in different individual respondents in each survey year. A major limitation of the questionnaire items is the lack of specificity on the types of activities the organizations were involved in and how close or distant their relationships were. Another limitation is that there are no questions about

working together with the general public, teachers, parents, or students, leaving out an entire sector of potential collaborators. The questions do not facilitate network analysis because only the presumed coordinating agency is asked to respond to questions about its relationships with other organizations.

*Classification of Laws Associated with School Students (CLASS)*

The Classification of Laws Associated with School Students is a scoring system that evaluates how closely state policies align with national standards and recommendations for school nutrition and physical education. The scoring system was developed using a conceptual framework based on the social-ecological model, a review of published and gray literature, and an expert panel from the National Cancer Institute, CDC, MayaTech (a social science consulting firm), and independent scientists.[71] Statutory and administrative policies were collected using the Westlaw legal database and scored by two independent raters (inter-rater agreement 75% and higher for nutrition scores and 88% and higher for physical education scores). Separate scores were given to policies in 19 nutrition and 9 physical education policy areas. Study 2 uses scores for competitive foods and beverages and physical education time requirements (Table 3), the policy areas with the strongest evidence linking them to healthier student behaviors and weight outcomes.[31,35]

**Table 3. Policy Areas Scored by the Classification of Laws Associated with School Students**

| Policy Area | Score Range | Grade Level(s) |
|---|---|---|
| **Food Service/Nutrition Policies** | | |
| Competitive foods and beverages (average) | 0-6 | ES, MS, HS |
| Foods (non-entrée) in cafeteria | 0-6 | |
| Beverages in cafeteria | 0-6 | |
| Foods in vending machines | 0-6 | |
| Beverages in vending machines | 0-6 | |
| Foods in other venues (school stores, canteens, snack bars) | 0-6 | |
| Beverages in other venues | 0-6 | |
| **Physical Education/Activity Policies** | | |
| PE time requirements | 0-5 | ES, MS, HS |
| *Note: ES is elementary school; MS is middle school; HS is high school; PE is physical education* | | |

The six policy areas addressing competitive foods and beverages in different school venues were averaged together, consistent with prior literature to facilitate

interpretation.[38,41] Scores reflect codified laws in effect as of December 31 of the calendar year. Study 2 used scores from 2006 and 2012, reflecting the most recent data update available, released in January 2016.[72] This update includes revised methodology for scoring some variables to reflect all standards specifically referenced in the codified law.

*National Survey of Children's Health (NSCH)*

Data on state-level prevalence of child and adolescent obesity were obtained from the 2011-2012 National Survey of Children's Health, a telephone survey of non-institutionalized children age 0-17 conducted by the National Center for Health Statistics of the CDC.[73] Random digit dialing was used to identify households with at least one child under age 18; one child was then selected at random to complete the interview. Interviews were conducted in English or Spanish. The survey covered a broad range of health and well-being topics, including children's physical and mental health status, access and use of health care services, family health and activities, and other topics. Parent-reported height and weight were used to calculate BMI-for-age to assess weight status. Obesity in children and adolescents was defined as having a BMI $\geq 95^{th}$ percentile of age- and sex- specific growth charts, and was only available for children ages 10-17. The NSCH is the only data source that enables comparisons of child health measures between states by weighting results to be representative of the population of children in each state and nationally.

*American Community Survey*

State-level demographic and socio-economic indicators (race/ethnicity, poverty rate, educational attainment) were obtained from the American Community Survey (ACS). The ACS is released in 1-year, 3-year, and 5-year averages at various geographic levels. Studies 1 and 2 used 3-year averages of state-level data in order to balance precision of the estimates with the length of the time period reflected. The 2013 ACS 3-year data release averages over the period 2011-2013.[74]

*University of Kentucky Center for Poverty Research*

Political and economic indicators were obtained from the University of Kentucky

Center for Poverty Research (www.ukcpr.org). UKCPR compiles data from national data sources on state-level poverty-related indicators. Political affiliation was obtained from the Council of State Governments. Unemployment rates were annual averages obtained from the Bureau of Labor Statistics as the percent of the civilian non-institutionalized labor force that was unemployed.

*Trust for America's Health (TFAH)*

Trust for America's Health is a non-profit non-governmental health policy organization that publishes a series of reports on state and federal public health spending. Studies 1 and 2 used two measures of funding: total CDC funding and state public health budgets in fiscal year 2011-2012. Public health funding is hypothesized to be a contextual factor affecting collaboration because it measures resources available for public health activities, including obesity prevention and health promotion in schools.

CDC funding included all funds awarded to state and local health departments, universities, and public and private agencies in each state. To calculate state public health budgets, TFAH obtained publicly available executive budget documents, state appropriations bills, documents from legislative analysis offices, and other public documents from state agencies. Public health budgets include all health funding (general revenue and dedicated funds) with the exception of Medicaid and the Children's Health Insurance Program, comparable health insurance programs for low-income residents, mental health funds, services related to developmental disabilities or severely disabled persons, funds for the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), and state-sponsored pharmaceutical programs.[75]

## Study 1: Cross-sector Collaboration on School Nutrition and Physical Education: State-level Trends and Correlates

*Introduction*

The multifactorial nature of the childhood obesity epidemic has led to calls for increased collaboration across multiple sectors of society to address the environmental, social, and policy factors driving the epidemic.[13,42,56,76] Cross-sector collaborative partnerships, or groups of organizations from different sectors (e.g., public agencies, community-based organizations, private businesses) have been particularly active in obesity prevention activities in primary and secondary school settings. These partnerships have successfully pursued shared goals such as developing comprehensive wellness policies and changing state policies.[51,54,76]

Collaborative partnerships are theorized to be more effective in achieving broad social change than efforts by a single sector (e.g., public agencies) because they leverage the skills, knowledge, resources, and power of their member organizations.[59,66] Cross-sector collaboration has been found to improve community capacity to make community-wide changes for obesity prevention by increasing community engagement and identifying opportunities for environmental and policy interventions.[49-52] States and communities that engage cross-sector partners have also adopted more obesity-related policies,[45,53] and more successfully implemented obesity-related policies and practices in schools and communities.[45,54] Despite widespread emergence of collaborative partnerships for childhood obesity prevention over the past decade, little research has examined the conditions under which collaborative partnerships develop[77] and how cross-sector collaboration can be structured to achieve the greatest outcomes for obesity prevention.[46,76,78]

Partnership breadth (the number of sectors or organization types participating in the partnership) is one structural feature of partnerships that is theorized to affect partnerships' management, activities, and outcomes.[59,60,65] Greater breadth is expected to allow partnerships to take on broader and more comprehensive activities and increase the likelihood of effecting positive change.[59,66,68] The primary aim of this study was to

examine how organizational participation in state-level collaborative partnerships addressing school nutrition and physical education (PE) evolved from 2000—2012, a very active period of policy and programmatic initiatives for obesity prevention in schools.[19] A secondary aim of this study was to identify the political, social, and economic conditions associated with state-level partnership breadth in 2012. I hypothesized that breadth would increase over time as collaborative partnerships matured and that breadth would vary across political, social, and economic characteristics of states.[79]

*Methods*

Data

State-level collaboration was measured using data from the nutrition services and physical activity questionnaires in the School Health Policies and Practices Study (SHPPS),[69] a national survey administered in all 50 states and the District of Columbia by the Centers for Disease Control and Prevention (CDC) in 2000, 2006, and 2012. Respondents to the nutrition services questionnaire were state-level directors, commissioners, or consultants for school nutrition services. Respondents to the physical activity questionnaire were state-level directors, specialists, or consultants for health and PE.

In the 2000 nutrition services questionnaire, a series of eight questions asked whether state-level child nutrition or food service (CNFS) staff worked on school food service or nutrition activities during the past 12 months with 1) state-level school health education staff; 2) state-level school health services staff; 3) state-level school mental health or social services staff; 4) state-level PE staff; and staff or members from 5) a state-level health organization, such as the American Heart Association or the American Cancer Society; 6) a food commodity organization, such as the Dairy Council or state produce growers association; 7) businesses; and 8) colleges or universities. In 2006 and 2012, five additional questions were asked (work with staff or members from 1) the state department of agriculture; 2) Action for Healthy Kids; 3) a state-level school nurses' association; 4) a state-level physician's organization, such as the American Academy of

Pediatrics; and 5) the state-level School Nutrition Association).

A similar series was asked in the physical activity questionnaire. In 2000, 10 questions asked whether state-level PE staff worked on PE activities during the past 12 months with 1) state-level school health education staff; 2) state-level school health services staff; 3) state-level school mental health or social services staff; 4) state-level school nutrition or food service staff; and staff or members from 5) the state parks or recreation department; 6) the state-level AAHPERD (American Alliance of Health, Physical Education, Recreation and Dance); 7) a state-level health organization, such as the American Heart Association or the American Cancer Society; 8) the Governor's Council on Physical Fitness and Sports; 9) businesses; and 10) colleges or universities. In 2006 and 2012, three additional questions were asked (work with staff or members from 1) Action for Healthy Kids; 2) a state-level school nurses' association; and 3) a state-level physician's organization, such as the American Academy of Pediatrics).

Response options were yes, no, or no state level staff in this area (for state-level staff questions only). Six states did not answer at least one question in the series in 2012, resulting in missing data for those questions. Responses were coded 1=yes and 0=no/no state level staff/no answer because lack of staff precluded collaboration with that sector and non-response suggests that the respondent was unsure or unaware of collaboration with that organization type.

Political, social, and economic characteristics found to predict state legislative activity on childhood obesity were examined as correlates of collaboration breadth.[20,80] Since the majority of state legislation on childhood obesity has focused on school settings,[81] it was hypothesized that many of the same contextual factors affecting legislative activity would also correlate with cross-sector collaboration on school nutrition and PE activities. State-level estimates from publicly available, national data sources were aligned with the time period of SHPPS data collection (Oct 2011- Mar 2012). Measures included presence of a state-level coordinator for school nutrition or PE (SHPPS 2012); political affiliation of governor and majority party in state legislature (Council of State Governments, 2011-2012 session, compiled by the University of Kentucky Center for Poverty Research); unemployment rate (Bureau of Labor Statistics,

2011, compiled by the University of Kentucky Center for Poverty Research); census region, percent non-Hispanic white, poverty rate, and percent of adults age ≥25 years with a high school education (2013 American Community Survey, 3-year estimates); childhood obesity prevalence (2011-2012 National Survey of Children's Health); and total CDC funding and state public health budgets (Trust for America's Health, fiscal year 2011). A full list of data sources is presented in Table 1.

Analysis

I computed counts of states collaborating with each organization type for 2000, 2006, and 2012 and calculated change separately for 2000-2006 and 2006-2012 using the comparable questions asked in both years. I measured collaboration breadth in each state as the sum of organization types collaborating with CNFS staff on school nutrition activities and, separately, with PE staff on PE activities. I examined average collaboration breadth in 2012 overall and stratified by state characteristics. To facilitate comparisons, I categorized continuous measures of state characteristics (percent non-Hispanic white, percent of adults with high school education, childhood obesity prevalence, poverty rate, unemployment rate, CDC funding, and state public health budget) into tertiles. I report means and 95% confidence intervals for collaboration breadth across strata of state characteristics. I did not conduct statistical tests for this descriptive analysis.

*Results*

Trends in School Nutrition Collaboration

Between 2000 and 2006, the number of states in which CNFS staff collaborated with other state-level school health staff increased (Table 4, top panel). In 2000, CNFS staff in 24 states reported collaborating with state-level PE staff, which increased to 40 states by 2006. Smaller increases were seen for collaboration between CNFS staff and state-level staff from health education (+8 states), mental health or social services (+7 states), and health services (+5 states). However, between 2006 and 2012, these increases were reversed (i.e., fewer states reported collaborating) for all state-level school health staff except state-level PE staff, which only decreased by 3 states.

**Table 4. Number of States Collaborating with Each Type of Organization on School Nutrition and Physical Education Activities, School Health Policies and Practices Study, 2000-2012**

| Organization Type | 2000 N | 2006 N | 2012 N | Change (2000-2006) N | Change (2006-2012) N |
|---|---|---|---|---|---|
| **School Nutrition Activities** | | | | | |
| State-level physical education staff | 24 | 40 | 37 | 16 | -3 |
| State-level school health education staff | 40 | 48 | 43 | 8 | -5 |
| State-level school health services staff | 37 | 42 | 37 | 5 | -5 |
| State-level school mental health/social services staff | 19 | 26 | 19 | 7 | -7 |
| Businesses | 25 | 32 | 26 | 7 | -6 |
| Academic Institutions | 46 | 48 | 45 | 2 | -3 |
| State-level health organization, such as the American Heart Association or the American Cancer Society | 36 | 39 | 31 | 3 | -8 |
| Action for Healthy Kids | n.a. | 48 | 41 | | -7 |
| State-level school nurses' association | n.a. | 35 | 36 | | 1 |
| State-level physicians' organization, such as the American Academy of Pediatrics | n.a. | 29 | 16 | | -13 |
| State Department of Agriculture | n.a. | 33 | 49 | | 16 |
| State-level School Nutrition Association | n.a. | 50 | 48 | | -2 |
| Food commodity organization, such as the Dairy Council or state produce growers association | 49 | 48 | 49 | -1 | 1 |
| **Physical Education Activities** | | | | | |
| State-level school nutrition or food service staff | 21 | 45 | 40 | 24 | -5 |
| State-level school health education staff | 36 | 43 | 43 | 7 | 0 |
| State-level school health services staff | 24 | 42 | 36 | 18 | -6 |
| State-level school mental health/social services staff | 17 | 25 | 22 | 8 | -3 |
| Businesses | 15 | 22 | 25 | 7 | 3 |
| Academic Institutions | 36 | 45 | 44 | 9 | -1 |
| State-level health organization, such as the American Heart Association or the American Cancer Society | 31 | 39 | 39 | 8 | 0 |
| Action for Healthy Kids | n.a. | 42 | 35 | | -7 |
| State-level school nurses' association | n.a. | 32 | 34 | | 2 |
| State-level physicians' organization, such as the American Academy of Pediatrics | n.a. | 22 | 17 | | -5 |
| State Parks or Recreation Department | 12 | 21 | 22 | 9 | 1 |
| Governor's Council on Physical Fitness and Sports | 21 | 30 | 21 | 9 | -9 |
| State-level AAHPERD | 35 | 45 | 46 | 10 | 1 |

n.a. Question not asked in 2000 survey
AAHPERD is American Alliance of Health, Physical Education, Recreation and Dance

In addition, the number of states in which CNFS staff reported collaborating with staff or members from businesses and academic institutions increased between 2000 and 2006 and decreased between 2006 and 2012, leaving overall collaboration unchanged between 2000 and 2012. Between 2006 and 2012 there were decreases in the number of states in which CNFS staff reported collaborating with non-profit organizations,

including state-level health organizations (-8 states), Action for Healthy Kids (-7 states), and state-level physician's organizations (-13 states). The only notable increase during this later period was the number of states in which CNFS staff reported collaborating with staff from the state department of agriculture (+16 states).

In 2006 and 2012, CNFS staff in a majority of states reported collaborating with all organization types except school mental health or social services staff and staff or members from a state-level physician's organization. The most common collaborators throughout the period under study were state-level health education staff (40-48 states), academic institutions (45-48 states), Action for Healthy Kids (41-48 states), state school nutrition associations (48-50 states), and food commodity organizations (48-49 states).

Trends in Physical Education Collaboration

Between 2000 to 2006, the number of states in which PE staff reported collaborating with each organization type increased by 7-24 states (Table 4, bottom panel). The greatest increases were observed for collaboration with state-level school nutrition/food service staff (+24 states) and state-level health services staff (+18 states). Between 2006 and 2012, there were few increases and several notable decreases in the number of states in which PE staff reported collaborating with staff or members from non-profit organizations, including the Governor's Council on Physical Fitness and Sport (-9 states), Action for Healthy Kids (-7 states), and state-level physician's organizations (-5 states).

Compared to CNFS staff, PE staff were less likely to report collaborating with the following organization types in 2000: state-level staff from school health education, health services, and mental health or social services, and staff or members from businesses, academic institutions, and state-level health organizations. However, following the larger increases in collaboration reported by PE staff, collaboration with most organization types was similar for PE activities and school nutrition activities in 2012.

National Distribution of Collaboration Breadth

In 2012, the number of organization types working with CNFS staff on school

nutrition activities (collaboration breadth) ranged from 4 to 13 out of 13 organization types measured (Figure 2), with a median of 10. The number of organization types working with PE staff on PE activities ranged from 0 to 13, with a median of 9. Physical education staff from 3 states (Alaska, Rhode Island, and Wyoming) did not report collaborating with any organization types on PE activities.

Associations between Collaboration Breadth and State Characteristics

Collaboration breadth for both school nutrition and PE activities did not vary substantially across most state characteristics (Table 5). In states with a state-level PE coordinator, PE staff reported an average collaboration breadth of 9.1 organization types, compared to 5.7 in states without a PE coordinator. All but two states had a state-level school nutrition coordinator, and this measure was excluded from analysis due to lack of variability in the data. Greater breadth of collaboration for PE activities existed in states with the highest levels of childhood obesity and poverty. Collaboration breadth for both school nutrition and PE was lowest among states with the lowest levels of CDC funding (8.4 and 6.9 organization types, respectively). States with the highest level of CDC funding had the largest collaboration breadth for school nutrition (10.0 organization types). States with larger public health budgets also had higher collaboration breadth for PE (7.0 organization types in the lowest level, versus 8.9 and 9.1 in the middle and highest levels, respectively).

**Figure 2. Distribution of Number of Organization Types Working with State Agency Staff on School Nutrition and Physical Education Activities (Collaboration Breadth), United States, 2012**

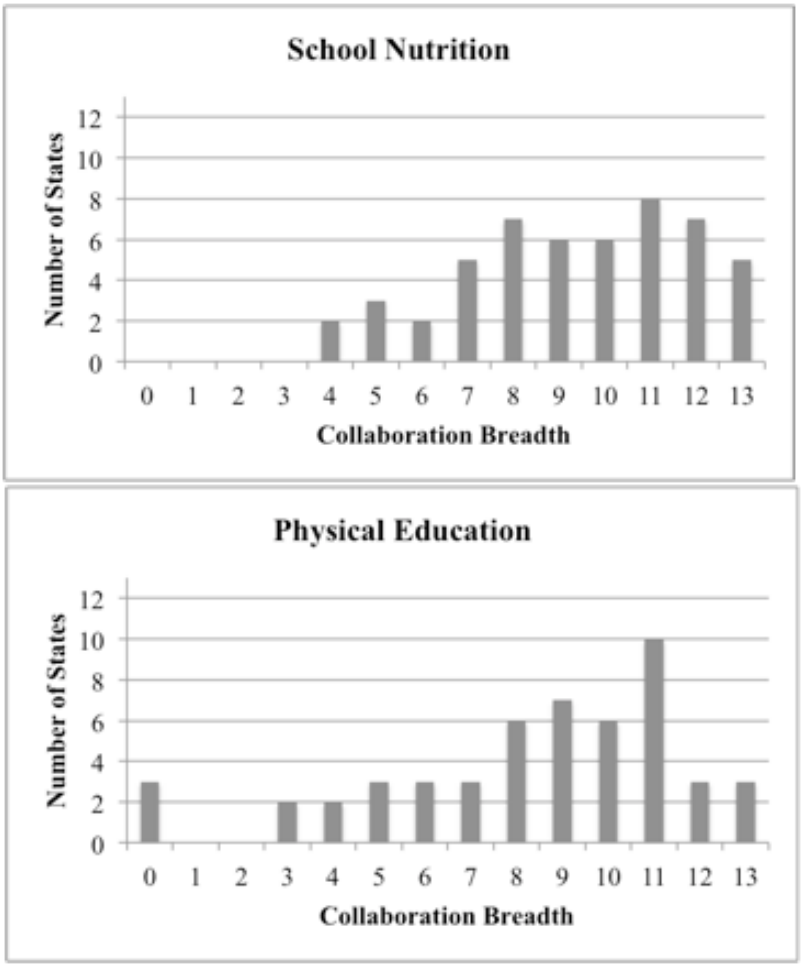


**Table 5. Associations between State Characteristics and Number of Collaborators on School Nutrition and Physical Education Activities, United States, 2012**

| | | School Nutrition | Physical Education |
|---|---|---|---|
| | N | Mean (95% CI) | Mean (95% CI) |
| **All States and DC** | **51** | **9.4 (8.7-10.1)** | **8.3 (7.4-9.2)** |
| **Geographic Region**[a] | | | |
| Northeast | 9 | 9.3 (7.5-11.1) | 7.2 (4.5-9.9) |
| Midwest | 12 | 10.1 (8.5-11.7) | 8.1 (6.4-9.7) |
| South | 17 | 9.4 (8.5-10.3) | 9.6 (8.5-10.8) |
| West | 13 | 8.6 (7.0-10.2) | 7.5 (5.4-9.6) |
| **Government/Political Characteristics** | | | |
| State PE (Physical Education) Coordinator[bc] | | | |
| No | 9 | | 5.7 (3.1-8.3) |
| Yes | 41 | | 9.1 (8.3-9.9) |
| State Legislature[de] | | | |
| 0 houses Democratic majority | 29 | 9.3 (8.3-10.2) | 7.9 (6.6-9.3) |
| 1 house Democratic majority | 5 | 9.4 (6.9-11.9) | 9.0 (6.8-11.2) |
| 2 houses Democratic majority | 15 | 9.5 (8.3-10.8) | 8.6 (7.0-10.2) |
| Governor[de] | | | |
| Not a Democrat | 30 | 9.2 (8.3-10.0) | 8.3 (6.9-9.6) |
| Democrat | 20 | 9.8 (8.6-10.9) | 8.4 (7.2-9.5) |
| **Social Characteristics** | | | |
| Percent of Population Non-Hispanic White[a] | | | |
| Lowest Tertile | 18 | 9.2 (8.0-10.3) | 8.3 (6.9-9.7) |
| Middle Tertile | 16 | 10.1 (8.9-11.2) | 9.1 (7.5-10.6) |
| Highest Tertile | 17 | 8.9 (7.6-10.2) | 7.6 (5.8-9.5) |
| Percent of Adults with High School Education[a] | | | |
| Lowest Tertile | 17 | 9.4 (8.2-10.5) | 9.0 (7.4-10.6) |
| Middle Tertile | 17 | 9.8 (8.5-11.1) | 8.4 (7.2-9.5) |
| Highest Tertile | 17 | 8.9 (7.7-10.1) | 7.6 (5.7-9.5) |
| Childhood Obesity Prevalence[f] | | | |
| Lowest Tertile | 17 | 8.9 (7.6-10.3) | 7.9 (6.1-9.7) |
| Middle Tertile | 17 | 9.9 (8.8-11.0) | 7.4 (5.9-9.0) |
| Highest Tertile | 17 | 9.2 (8.1-10.4) | 9.6 (8.4-10.9) |
| **Economic Characteristics** | | | |
| Poverty Rate[a] | | | |
| Lowest Tertile | 17 | 9.4 (8.1-10.7) | 7.9 (6.1-9.6) |
| Middle Tertile | 17 | 8.9 (7.6-10.2) | 7.2 (5.6-8.9) |
| Highest Tertile | 17 | 9.8 (8.8-10.7) | 9.8 (8.7-10.9) |
| Unemployment Rate[d] | | | |
| Lowest Tertile | 17 | 9.4 (8.2-10.6) | 7.6 (5.9-9.2) |
| Middle Tertile | 17 | 9.2 (7.9-10.4) | 8.7 (7.1-10.3) |
| Highest Tertile | 17 | 9.5 (8.3-10.6) | 8.6 (7.1-10.2) |
| CDC Funding[g] | | | |
| Lowest Tertile | 17 | 8.4 (7.1-9.6) | 6.9 (4.8-9.0) |
| Middle Tertile | 17 | 9.7 (8.7-10.7) | 10.2 (9.4-10.9) |
| Highest Tertile | 17 | 10.0 (8.6-11.4) | 7.9 (6.6-9.2) |
| State Public Health Budget[g] | | | |
| Lowest Tertile | 17 | 9.1 (7.9-10.3) | 7.0 (4.9-9.1) |
| Middle Tertile | 17 | 9.6 (8.3-10.9) | 8.9 (7.7-10.0) |
| Highest Tertile | 17 | 9.4 (8.1-10.6) | 9.1 (7.8-10.3) |

Notes:
CI is confidence interval
DC is District of Columbia
CDC is Centers for Disease Control and Prevention
[a] American Community Survey
[b] School Health Policies and Practices Survey
[c] Number of states refers to state physical education coordinator (data was missing from Rhode Island). State nutrition coordinator omitted from analysis because 49 of 51 states have a state nutrition coordinator.
[d] University of Kentucky Center for Poverty Research
[e] Nebraska and the DC omitted from state legislature affiliation measure and DC omitted from the governor affiliation measure. Nebraska has a unicameral, nonpartisan legislature. DC is governed by a city council and mayor.
[f] National Survey of Children's Health
[g] Trust for America's Health

*Discussion*

Collaboration with public, private, and non-profit partners is common among state-level CNFS and PE staff, with half of them collaborating with 9-10 out of 13 organization types measured in 2012. Between 2000 and 2006, collaboration increased among all organization types on PE activities and all except one organization type on school nutrition activities. This trend is consistent with theories and prior research on collaborative partnerships, which posit that the breadth of collaborative networks will expand as they mature.[66,82] The increase may also reflect states' efforts to support school districts' development of federally mandated wellness policies between 2004-2006 (PL 108-265).

The stabilization and decline in collaboration with various organization types between 2006-2012 may indicate that states were reaching a theorized threshold for breadth, beyond which additional partners bring little added benefit and may hinder agreement on goals.[68] A few carefully selected partners with diverse and relevant expertise may yield similar results with lower time and resource costs than a very large, diffuse network. More research on the processes and outcomes of collaborative partnerships for childhood obesity prevention is needed to answer this question. These findings indicate that organizational membership in collaborative partnerships changes over time, perhaps as a result of shifting priorities or strategies or as part of the theorized maturation and stabilization process mentioned above.

Of particular interest is the expansion across the country in collaboration between

state-level school health staff from diverse disciplines, including large increases in the number of states in which state-level CNFS and PE staff report working with each other on both topics. State agency staff are often responsible for coordinating implementation activities, including providing resources, training, and technical assistance to schools and districts.[83] Whether increased collaboration across departments has resulted in more effective or useful supports for implementation of federal and state policies at the school level is an important question for future research.

In 2000, CNFS staff collaborated with a larger number of organizations compared with PE staff across all organization types examined. However, by 2012, the number of states in which CNFS and PE staff reported collaborating with each organization type was similar. An earlier analysis of 2000-2006 SHPPS data found that growth in collaborative partnerships for PE activities coincided with increases in states' policy scores in several PE-related domains, including PE staff development opportunities and PE standards and compliance.[82] Together, these findings suggest that interest in creating school environments that support PE and physical activity is increasing, while interest in school nutrition and food service policies has remained high during this period. A more recent analysis found that state agencies provided more types of implementation support to schools and school districts on nutrition and food service topics than PE and physical activity topics in 2012,(K Grannon, MPH, et al., unpublished data, April 2016) which may reflect PE laws that are weak and nonspecific in most states.[35] In order to create school environments that support healthy weight, states should pursue a comprehensive approach to changing school policies and practices addressing both nutrition and physical activity.

A few patterns in collaboration across state characteristics warrant discussion. In states with a state-level PE coordinator, collaboration was reported with an average of 3.4 more organization types than in states without a coordinator. While it cannot be determined from the SHPPS data what role state-level PE coordinators played in developing and managing cross-sector collaboration, theory and practice suggest that having an individual or organization that acts as a convener or coordinator is an important component of cross-sector collaboration formation and effectiveness, and this is a natural

role for state PE coordinators.[84] Interestingly, nearly all states had a state-level school nutrition coordinator, which is perhaps a reflection of the greater historical emphasis on school nutrition and food service policies compared to PE and physical activity.

In 2012, states receiving the lowest levels of CDC funding collaborated with fewer types of organizations on school nutrition and PE activities. Some CDC grants are designed to increase collaboration and build capacity for environmental and policy change.[45] Previous studies have found mixed results on the relationship between availability of public health funding and other related outcomes, such as the enactment of obesity legislation. One study found no association between several measures of state and federal funding for population health and policy enactment between 2003-2005.[20] Another study found that states receiving funding through CDC's Nutrition and Physical Activity Program to Prevent Obesity and Other Chronic Diseases or Coordinated School Health Program enacted twice as many obesity-related laws in 2005 as states that did not receive funds through these programs.[85] These grants were specifically intended to build partnerships and capacity for obesity prevention activities, including policy change. The mechanisms through which funding may affect obesity-related collaboration and policy development, enactment, and implementation are important issues for future research.

States with higher poverty and higher prevalence of childhood obesity also exhibited broader collaboration on PE activities, which could indicate greater mobilization of diverse sectors for childhood obesity prevention in states where the burden of childhood obesity is highest. Presence of a complex health problem is a strong motivator for cross-sector collaboration; however, lack of funding, poverty, and other social issues may limit the effectiveness of a collaborative's work.[46]

Strengths and Limitations

A strength of the SHPPS data and this analysis is the ability to examine the same questions at three time points for all 50 states and the District of Columbia. Few studies of collaborative partnerships have the advantage of longitudinal or national data. However, there are several limitations in the SHPPS data. SHPPS provides only the perspective of one organizational respondent, state-level CNFS staff or PE staff.

Furthermore, the questions do not specify how the organizations work together, and it is possible that joint activities are merely coordinated activities rather than truly collaborative relationships involving shared goals and integrated strategies. The survey also does not measure collaborative activities with organizations not listed on the survey or the number of individuals or organizations working together within each type of organization (e.g., businesses, academic institutions); furthermore, the individuals responding to the survey in each year likely differ as a result of staff turnover. Despite these limitations, the SHPPS survey offers a national perspective on cross-sector activities on obesity prevention in schools during a period of rapidly changing state and federal policies.

## Conclusion

Cross-sector collaboration on school nutrition and PE was widespread and did not vary substantially across most political, social, and economic measures. State agency staff working on school nutrition and PE are increasingly working together on activities addressing both topic areas. More research is needed to understand how state agencies and departments work across sectors on obesity prevention activities and the impact this may have on the types of support they provide to schools.

## Study 2: Evidence-based Policies on Competitive Food and Beverage Standards and Physical Education Time Requirements: Associations with State-Level Collaboration, Obesity, and Socio-Economic Indicators

*Introduction*

The ultimate goal of public health collaborative partnerships is to develop and support policies that improve population health, yet not all policies are equally effective in achieving this goal. There is increasing evidence that specific environmental strategies and policies, particularly in school settings, may lead to improvements in diet, physical activity, and weight. State policies mandating specific nutrition standards for competitive foods/beverages (CF) in school cafeterias, vending machines, and other venues have been linked to reduced availability of prohibited items,[83] reduced in-school consumption of prohibited items,[86-89] and healthier in-school dietary intake,[90] though evidence has been mixed on their relationship to obesity and body mass index (BMI) change.[34,38] In addition, state policies that require a specific, minimum amount of time spent in physical education (PE) may increase schools' provision of PE,[91] increase PE attendance and activity,[35] and reduce the risk of obesity.[37]

In fact, little is known about any state-level factors associated with enactment of the above evidence-based policies. Nearly all studies examining correlates of state policy[19,20,80,85,92] do not distinguish between policies with specific, mandated standards, such as those above, and weaker policies that contain only recommendations or vague wording, which have generally not be shown to be effective.[35,41] Only one study examined correlates of specific, mandated state PE policies, and found that disadvantaged states (those with a higher proportion of students eligible for free/reduced price lunch, higher child poverty and overall poverty rates, and a higher proportion of female-headed households) were more likely to enact policies compared to more advantaged states.[93]

Theory and practice of collaborative partnerships suggest that several structural and functional features of partnerships impact their effectiveness.[52,68] However, no studies to date have examined whether features of state-level collaborative partnerships are associated with the presence of empirically supported obesity prevention policies. For

example, partnerships that include organizational members with advocacy-oriented missions and expertise, such as some non-profit organizations, may be able to engage in a wider range of direct advocacy and lobbying activities than partnerships without this representation. Conversely, some obesity prevention leaders have expressed concerns about engaging members of the food and beverage industry as partners in nutrition- and obesity-related collaboration in light of potential financial conflicts of interest the industry may have in reducing consumption of some products.[56] Others argue that working collaboratively with industry, rather than developing policy proposals that industry is sure to oppose, is more likely to result in progress.[56]

Only one study to date has evaluated the relationship between statewide obesity prevention partnerships and state policy change. Hersey et al. found that states receiving funding from the Centers for Disease Control and Prevention (CDC)'s Nutrition, Physical Activity, and Obesity program enacted more obesity-related state legislation than states without funding.[85] Furthermore, among states that received funding, those with high partnership involvement implemented four times as many local policies as states with low partnership involvement.[45]

The aims of this study were two-fold: 1) to examine the prevalence of evidence-based CF and PE state policies in 2006 and 2012, and 2) to examine associations between these policies and statewide collaboration on school nutrition and physical education activities with specific types of organizations (state-level school health staff, health-focused non-profit organizations, businesses, and state departments of parks/recreation), state-level childhood obesity prevalence, socio-economic indicators, and public health funding levels in 2012. Collaboration with more types of state-level school health staff and non-profit organizations was hypothesized to be positively associated with enacted evidence-based CF and PE policies in 2012, while collaboration with businesses was hypothesized to be negatively associated with these policies. Greater childhood obesity prevalence, socio-economic disadvantage, and public health funding were also hypothesized to be positively associated with CF and PE policies. This study contributes to the literature on collaborative partnerships for obesity prevention policy in two ways: it is the first study to examine the association between collaboration with specific types of

organizational partners and state policy outcomes, and it is among the first to examine state-level correlates of specific policies associated with child behavior and weight.

*Methods*

Policy Scores

The Classification of Laws Associated with School Students is a scoring system developed by the National Cancer Institute that evaluates how closely state laws align with national standards and recommendations for school nutrition and physical education.[71] A score of 0 indicates no codified law; a score of 1 indicates a law that recommends but does not require any action; a score of 2 indicates mandated action with nonspecific requirements (e.g., "healthy" foods/beverages); and a score greater than 2 indicates mandated, specific actions. The maximum possible score varies by policy topic. Scores reflect codified laws in effect as of December 31 of the calendar year for all 50 states and the District of Columbia (hereafter referred to as "states"). Updated scores for all years, which include revised methodology for scoring some variables, were released in January 2016.[72] This study uses updated scores for 2006 and 2012 laws.

Consistent with prior literature,[34,38] scores from six policy areas (nutrition standards for a la carte foods in cafeterias, beverages in cafeterias, foods in vending machines, beverages in vending machines, foods in school stores and canteens, beverages in school stores and canteens) were averaged into one CF score for each grade level (elementary, middle, and high school). These six scores had high internal consistency (Cronbach's alpha=0.98), reflecting that most states have a common set of standards across all in-school locations. States' PE score is based on one policy score reflecting mandated minimum time requirements for PE at elementary, middle, and high school. Specific scoring criteria for each policy are provided in Appendix A. The primary outcome was whether a state had codified laws with specific, mandated requirements (average CF or PE score >2, hereafter, "strong policies") at each grade level.

Collaboration Measures

State-level collaboration was measured using data from the nutrition services and

physical activity questionnaires in the School Health Policies and Practices Study (SHPPS), a national survey administered to all states by the CDC in 2012.[69] Respondents to the nutrition services questionnaire were state-level directors, commissioners, or consultants for school nutrition services. Respondents to the physical activity questionnaire were state-level directors, specialists, or consultants for health and PE.

A series of questions asked whether state-level child nutrition or food service staff worked on various school food service or nutrition activities during the past 12 months with staff or members from various types of organizations. A similar series in the physical activity questionnaire asked whether state-level PE staff worked on PE activities during the past 12 months with various organization types. This study examines collaboration with the following organization types: five types of state-level school health staff; staff or members from five types of health-focused non-profit and professional organizations; staff or members of businesses; and staff or members of the state department of parks or recreation (asked on physical activity questionnaire only).

The specific types of school health staff were health education, health services, mental health or social services, and either physical education (on the nutrition questionnaire) or school nutrition or food service staff (on the physical activity questionnaire), for a theoretical maximum of 4 for either school nutrition or PE activities. The specific types of non-profit organizations were a state-level health organization, such as the American Heart Association or the American Cancer Society; Action for Healthy Kids; a state-level school nurses' association; a state-level physician's organization, such as the American Academy of Pediatrics; and the Governor's Council on Physical Fitness and Sports (on the physical activity questionnaire only), for a theoretical maximum of 4 for school nutrition activities and 5 for PE activities.

Participants were asked about the following additional organizational types on the survey, but these were not included in this analysis because over 85% of states collaborated with them in 2012: academic institutions, food commodity organization, state department of agriculture, school nutrition association, and state-level chapter of the American Association of Health, Physical Education, Recreation and Dance (now known as SHAPE America, or Society of Health and Physical Educators).

Response options were yes, no, or no state level staff in this area (for state-level staff questions only). Six states did not answer at least one question in the series in 2012, resulting in missing data for those questions. Responses were coded 1=yes and 0=no/no state level staff/no answer because lack of staff precluded collaboration with that sector and non-response suggests that the respondent was unsure or unaware of collaboration with that organization type.

Seven collaboration measures were created for analysis: a summative score of the number of state-level school health staff collaborating on each of school nutrition and PE activities; a summative score of the number of health-focused non-profit organizations collaborating on each of school nutrition and PE activities; a dichotomous measure of collaboration with businesses on each of school nutrition and PE activities; and a dichotomous measure of collaboration with the state department of parks/recreation on PE activities.

State Characteristics

The following state characteristics were included in the analysis as potential confounders of the collaboration-policy relationship based on previous studies: childhood obesity prevalence (National Survey of Children's Health, 2011-2012);[40,41] high school non-completion rate,[20] poverty rate,[93] proportion non-white or Hispanic residents[80,92] (American Community Survey, 3-year estimates from 2011-2013); and total CDC funding and state public health budget (Trust for America's Health, FY 2011-12).[85]

Analysis

The proportion of states with a strong CF or PE policy was calculated for each grade level in 2006 and 2012. Proportions were also calculated for each category of collaboration measures and state characteristics (dichotomized at the median). Prevalence ratios were estimated to examine associations between state characteristics and policy outcomes in 2012. For each grade-specific policy outcome, generalized linear models with a log link and binomial family were used to predict the probability of having a strong policy in 2012 as a function of each measure of collaboration in 2012. Separate models were estimated for each measure. Summative scores of collaboration with school

health staff and non-profit organizations were modeled as continuous independent variables; collaboration with businesses and state departments of parks/recreation were included as dichotomous independent variables. Adjusted models were estimated with each collaboration measure, controlling for each state characteristic separately. The small number of observations (N=51) precluded estimation of models adjusting for more than one state characteristic at a time.

*Results*

Prevalence and Change in Competitive Foods and Physical Education Policies

Strong CF policies were more common in younger grade levels in both 2006 and 2012 (Table 6). In 2006, 37% of states had strong CF policies for elementary schools, compared to 25% for middle schools and 20% for high schools. Between 2006 and 2012, 12 states enacted strong CF policies for elementary schools, bringing the prevalence of strong policies to 61% in 2012. A similar number of states also enacted strong CF policies for middle and high schools. No state had an average CF policy score in 2012 that was lower than its score in 2006.

**Table 6. Number and Proportion of States with Strong State Policy on Competitive Foods and Physical Education Time Requirements, Classification of Laws Associated with School Students, 2006-2012**

| | **2006** | **2012** | **Change** |
|---|---|---|---|
| **Policy Domain** | N (%) | N (%) | N (%) |
| **Competitive Foods**[a] | | | |
| Elementary School | 19 (37%) | 31 (61%) | 12 (24%) |
| Middle School | 13 (25%) | 26 (51%) | 13 (25%) |
| High School | 10 (20%) | 21 (41%) | 11 (22%) |
| | | | |
| **Physical Education Time**[b] | | | |
| Elementary School | 13 (25%) | 16 (31%) | 3 (6%) |
| Middle School | 8 (16%) | 10 (20%) | 2 (4%) |
| High School | 5 (10%) | 7 (14%) | 2 (4%) |

Notes:
a Competitive Foods policy is defined as an average score >2 across 6 measures of nutrition standards for competitive foods and beverages in school cafeterias, vending machines, and other venues (e.g., school stores/canteens)
b Physical Education Time policy is defined as a score >2 on a single measure of states' laws requiring minimum time spent in physical education

The prevalence of strong PE policies was lower than for CF policies, but showed the same trend of being elevated in younger grade levels compared to older grades (Table 6). In 2006, 25% of states had strong PE policies for elementary schools, compared to 16% for middle schools and 10% for high schools. There was also much less change in PE policies between 2006 and 2012: only three states enacted a strong PE policy for elementary schools, and two states each enacted a strong policy for middle or high schools. No state weakened PE policies during this period.

Associations between Collaboration and Policies

State-level child nutrition and PE staff were similarly likely to collaborate with other organizations in 2012 (Table 7, far left column). Strong CF policies in all grade levels were most common among states in which child nutrition staff collaborated with 3-4 types of state-level school health staff and least common among states in which child nutrition staff collaborated with 1-2 types of state-level school health staff. For example, 71% of states in which child nutrition staff collaborated with 3-4 types of school health staff had strong CF policies in elementary schools compared to no more than half of states that collaborated with fewer than 3 types of school health staff (Table 7). Less consistent trends were observed for collaboration with non-profit organizations and businesses. There were also no clear trends between collaboration with any organization types and prevalence of strong PE policies.

Consistent with these descriptive results, the association between collaboration with school health staff and strong CF policies in unadjusted regression models was the only measure that was consistent across grade levels (prevalence ratio [PR]=1.17-1.20) (Table 8). However, none of the collaboration measures was statistically significantly associated with having strong CF or PE policies in 2012 in the unadjusted regression models. Adjusted regressions yielded results similar to the unadjusted models (results not shown).

**Table 7. Prevalence of collaboration and strong policies by grade level, United States, 2012**

| | Elementary School % | Middle School % | High School % |
|---|---|---|---|
| **Organizations Collaborating with State Child Nutrition Staff on School Nutrition Activities (Prevalence)** | **Prevalence of Strong Competitive Foods[c] Policy** | | |
| State-Level School Health Staff[a] | | | |
| *No collaboration (12%)* | 50 | 50 | 33 |
| *1-2 organizations (22%)* | 36 | 36 | 27 |
| *3-4 organizations (67%)* | 71 | 56 | 47 |
| Health-Focused Non-profit Organizations[b] | | | |
| *No collaboration (4%)* | 50 | 50 | 50 |
| *1-2 organizations (51%)* | 58 | 50 | 35 |
| *3-4 organizations (45%)* | 65 | 52 | 48 |
| Businesses | | | |
| *No (49%)* | 68 | 56 | 40 |
| *Yes (51%)* | 54 | 46 | 42 |
| **Organizations Collaborating with State Physical Education Staff on Physical Education Activities (Prevalence)** | **Prevalence of Strong Physical Education Time[d] Policy** | | |
| State-Level School Health Staff[a] | | | |
| *No collaboration (10%)* | 0 | 0 | 0 |
| *1-2 organizations (24%)* | 50 | 33 | 17 |
| *3-4 organizations (67%)* | 29 | 18 | 15 |
| Health-Focused Non-profit Organizations[b] | | | |
| *No collaboration (8%)* | 25 | 25 | 25 |
| *1-2 organizations (31%)* | 25 | 19 | 25 |
| *3-5 organizations (61%)* | 35 | 19 | 6 |
| Businesses | | | |
| *No (51%)* | 27 | 15 | 19 |
| *Yes (49%)* | 36 | 24 | 8 |
| State Department of Parks/Recreation | | | |
| *No (57%)* | 24 | 17 | 14 |
| *Yes (43%)* | 41 | 23 | 14 |

Source: School Health Policies and Practices Study, Classification of Laws Associated with School Students (CLASS)

Notes: a State-level school health staff are from health education, health services, mental health and social services, and either nutrition/food service or physical education (range: 0-4)

b Health-focused non-profit organizations are state-level health organizations, Action for Healthy Kids, school nurses association, state physicians' association, and governor's council on physical fitness and sports (range: 0-4 for Competitive Foods and 0-5 for Physical Education)

c Competitive Foods policy is defined as an average score >2 across 6 measures of nutrition standards for competitive foods and beverages in school cafeterias, vending machines, and other venues (e.g., school stores/canteens)

d Physical Education Time policy is defined as a score >2 on a single measure of states' laws requiring minimum time spent in physical education

**Table 8. Unadjusted Associations between State Collaboration and Strong Policies, United States, 2012**

| | Elementary School | | Middle School | | High School | |
|---|---|---|---|---|---|---|
| **Collaboration Measure** | **PR** | **95% CI** | **PR** | **95% CI** | **PR** | **95% CI** |
| **School Nutrition Activities** | | | **Competitive Foods[c]** | | | |
| State-Level School Health Staff[a] | 1.20 | [0.98,1.47] | 1.18 | [0.91,1.52] | 1.17 | [0.88,1.56] |
| Health-Focused Non-profit Organizations[b] | 1.12 | [0.92,1.37] | 1.06 | [0.83,1.34] | 1.12 | [0.83,1.51] |
| Businesses | 0.79 | [0.51,1.24] | 0.82 | [0.48,1.42] | 1.06 | [0.55,2.04] |
| **Physical Education Activities** | | | **Physical Education Time[d]** | | | |
| State-Level School Health Staff[a] | 0.99 | [0.75,1.32] | 0.97 | [0.65,1.43] | 1.05 | [0.63,1.75] |
| Health-Focused Non-profit Organizations[b] | 1.35 | [0.94,1.94] | 1.08 | [0.71,1.63] | 0.72 | [0.46,1.12] |
| Businesses | 1.34 | [0.59,3.04] | 1.56 | [0.50,4.88] | 0.42 | [0.09,1.95] |
| State Department of Parks/Recreation | 1.69 | [0.75,3.84] | 1.32 | [0.43,4.00] | 0.99 | [0.25,3.97] |

Source: School Health Policies and Practices Study, Classification of Laws Associated with School Students

Notes:

a State-level school health staff are from health education, health services, mental health and social services, and either nutrition/food service or physical education (range: 0-4)

b Health-focused non-profit organizations are state-level health organizations, Action for Healthy Kids, school nurses association, state physicians' association, and governor's council on physical fitness and sports (range: 0-4 for Competitive Foods and 0-5 for Physical Education)

c Competitive Foods policy is defined as an average score >2 across 6 measures of nutrition standards for competitive foods and beverages in school cafeterias, vending machines, and other venues (e.g., school stores/canteens)

d Physical Education Time policy is defined as a score >2 on a single measure of states' laws requiring minimum time spent in physical education

PR is prevalence ratio, CI is confidence interval

Associations between State Characteristics and Policies

Strong CF policies in elementary schools were more common among states with higher childhood obesity prevalence (PR=1.78, 95% CI: 1.11, 2.85), high school non-completion rate (PR=2.35, 95% CI: 1.36, 4.06), poverty rate (PR=1.89, 95% CI: 1.16, 3.09), and proportion of non-white or Hispanic residents (PR=1.75, 95% CI: 1.07, 2.85) (Table 9). In addition, 72% of states with CDC funding and state public health budgets above the median had strong CF policies in elementary schools, compared to 50% of states with funding below the median, though this difference was not statistically significant (PR=1.44, 95% CI: 0.91, 2.27). Associations at the middle school level were similar to the elementary school level for childhood obesity prevalence (PR=1.80, 95% CI: 1.02, 3.17) and state public health budgets (PR=1.42, 95% CI: 0.82, 2.46) and more modest for the remaining characteristics. There were no significant associations between state characteristics and strong CF policies in high schools.

There were fewer clear trends between state characteristics and having strong PE policies (Table 9). Many of the estimates had low precision (wide confidence intervals) resulting from sparse data, especially for high school policies. At the elementary school level, strong PE policies were more common among states with higher childhood obesity, high-school non-completion, poverty, proportion non-white or Hispanic residents, CDC funding, and state public health budgets. However, only higher high-school non-completion (RR=2.88, 95% CI: 1.07, 7.76) and a greater proportion of non-white or Hispanic residents (RR=2.88, 95% CI: 1.07, 7.76) were statistically significant.

Associations were generally more modest for middle and high school PE policies, and there were no significant associations between state characteristics and strong PE policies at these higher grade levels.

**Table 9. Unadjusted Associations between State Characteristics and Strong Policies, United States, 2012**

| State Characteristics | Elementary School % | PR | 95% CI | Middle School % | PR | 95% CI | High School % | PR | 95% CI |
|---|---|---|---|---|---|---|---|---|---|
| | | | | **Competitive Foods[a]** | | | | | |
| Childhood Obesity Prevalence | | | | | | | | | |
| *Below Median* | 44.4 | Ref. | | 37.0 | Ref. | | 37.0 | Ref. | |
| *Above Median* | 79.2 | 1.78 | [1.11,2.85] | 66.7 | 1.80 | [1.02,3.17] | 45.8 | 1.24 | [0.64,2.39] |
| High School Non-Completion | | | | | | | | | |
| *Below Median* | 36.0 | Ref. | | 36.0 | Ref. | | 36.0 | Ref. | |
| *Above Median* | 84.6 | 2.35 | [1.36,4.06] | 65.4 | 1.82 | [1.00,3.29] | 46.2 | 1.28 | [0.66,2.50] |
| Poverty Rate | | | | | | | | | |
| *Below Median* | 42.3 | Ref. | | 38.5 | Ref. | | 34.6 | Ref. | |
| *Above Median* | 80.0 | 1.89 | [1.16,3.09] | 64.0 | 1.66 | [0.94,2.94] | 48.0 | 1.39 | [0.71,2.70] |
| Proportion Non-White or Hispanic Residents | | | | | | | | | |
| *Below Median* | 44.0 | Ref. | | 40.0 | Ref. | | 36.0 | Ref. | |
| *Above Median* | 76.9 | 1.75 | [1.07,2.85] | 61.5 | 1.54 | [0.87,2.72] | 46.2 | 1.28 | [0.66,2.50] |
| CDC Total Funding | | | | | | | | | |
| *Below Median* | 50.0 | Ref. | | 50.0 | Ref. | | 46.2 | Ref. | |
| *Above Median* | 72.0 | 1.44 | [0.91,2.27] | 52.0 | 1.04 | [0.61,1.78] | 36.0 | 0.78 | [0.40,1.52] |
| State Public Health Budget | | | | | | | | | |
| *Below Median* | 50.0 | Ref. | | 42.3 | Ref. | | 38.5 | Ref. | |
| *Above Median* | 72.0 | 1.44 | [0.91,2.27] | 60.0 | 1.42 | [0.82,2.46] | 44.0 | 1.14 | [0.59,2.21] |
| | | | | **Physical Education Time[b]** | | | | | |
| Childhood Obesity Prevalence | | | | | | | | | |
| *Below Median* | 22.2 | Ref. | | 22.2 | Ref. | | 18.5 | Ref. | |
| *Above Median* | 41.7 | 1.87 | [0.80,4.39] | 16.7 | 0.75 | [0.24,2.34] | 8.3 | 0.45 | [0.10,2.11] |
| High School Non-Completion | | | | | | | | | |
| *Below Median* | 16.0 | Ref. | | 16.0 | Ref. | | 8.0 | Ref. | |
| *Above Median* | 46.2 | 2.88 | [1.07,7.76] | 23.1 | 1.44 | [0.46,4.51] | 19.2 | 2.40 | [0.51,11.27] |
| Poverty Rate | | | | | | | | | |
| *Below Median* | 19.2 | Ref. | | 19.2 | Ref. | | 11.5 | Ref. | |
| *Above Median* | 44.0 | 2.29 | [0.93,5.65] | 20.0 | 1.04 | [0.34,3.16] | 16.0 | 1.39 | [0.34,5.58] |
| Proportion Non-White or Hispanic Residents | | | | | | | | | |
| *Below Median* | 16.0 | Ref. | | 12.0 | Ref. | | 12.0 | Ref. | |
| *Above Median* | 46.2 | 2.88 | [1.07,7.76] | 26.9 | 2.24 | [0.65,7.72] | 15.4 | 1.28 | [0.32,5.16] |
| CDC Total Funding | | | | | | | | | |
| *Below Median* | 19.2 | Ref. | | 7.7 | Ref. | | 7.7 | Ref. | |
| *Above Median* | 44.0 | 2.29 | [0.93,5.65] | 32.0 | 4.16 | [0.98,17.72] | 20.0 | 2.60 | [0.55,12.19] |
| State Public Health Budget | | | | | | | | | |
| *Below Median* | 19.2 | Ref. | | 11.5 | Ref. | | 15.4 | Ref. | |
| *Above Median* | 44.0 | 2.29 | [0.93,5.65] | 28.0 | 2.43 | [0.71,8.35] | 12.0 | 0.78 | [0.19,3.14] |

Source: Classification of Laws Associated with School Students, National Survey of Children's Health, American Community Survey, Trust for America's Health

Notes:

a Competitive Foods policy is defined as an average score >2 across 6 measures of nutrition standards for competitive foods and beverages in school cafeterias, vending machines, and other venues (e.g., school stores/canteens)

b Physical Education Time policy is defined as a score >2 on a single measure of states' laws requiring minimum time spent in physical education

PR is prevalence ratio, CI is confidence interval

*Discussion*

Previous studies have found evidence that collaborative partnerships contribute to state and local policy change;[45,46,50,52,85] however, this study found no clear associations between collaboration and strong CF and PE policies. One reason for these findings may be the lack of specificity in the collaboration measures on the SHPPS. The survey questions refer to general collaboration on school nutrition and PE activities, which likely addressed a wide range of topics, including but not limited to development and implementation of state CF and PE policies. For example, collaborative activities among state agencies during the period measured by this study likely included preparations for implementing upcoming federal rules for both school meals programs and competitive foods (Healthy Hunger-Free Kids Act of 2010, Pub. L. 111-296) regardless of the strength of state policies on these topics. More specific measures of the goals, strategies, and management of collaborative partnerships are needed to evaluate the role of partnerships in policy development and enactment, including whether collaborative processes may result in weaker policies in an effort to reach consensus among all participants.

This study confirms prior research findings that more disadvantaged states—those that are most in need of effective obesity prevention efforts—were more likely to have strong state policies for elementary schools.[80,93] This conclusion provides additional evidence in support of the assertion that higher childhood obesity prevalence could be motivating states to adopt stronger obesity-related policies.[40,41,92] However, this conclusion applies only to younger grade levels. High schools remained least likely of all grade levels to be regulated by strong CF or PE policies in either 2006 or 2012, and policies targeting high schools were not correlated with any state characteristics. Other research has also documented differences in policy strength across grade levels at the school district level.[94-96] This finding is troubling because poor health behaviors, such as fast food intake and low physical activity, begin to increase in adolescence and continue tracking into young adulthood.[97-99] High school environments that encourage and facilitate healthy dietary behaviors and regular physical activity are needed to keep students on track to become healthy adults.

It is not yet known whether the enactment of evidence-based CF and PE policies in more disadvantaged states can contribute to reducing disparities in obesity prevalence within and across states. Disparities in obesity prevalence by race and socio-economic status persist, and may be getting worse in some areas, especially in rural settings.[1,23,100-102] States, communities, and schools should seek to develop policy and environmental change strategies that are effective for children facing the highest burden of obesity, and evaluations should be designed to measure the impact of these strategies on reducing disparities.[103]

The relationship between federal and state public health funding and state policies targeting elementary and middle schools was generally positive, providing modest evidence that greater funding availability may support states' efforts to enact or implement strong CF and PE policies. Unlike the study by Hersey et al.,[85] the funding measures used in this study were not specific to obesity prevention activities. CDC funds included all funds awarded to state and local health departments, universities, and public and private agencies in each state. State public health budgets included all health funding (general revenue and dedicated funds) with the exception of Medicaid/CHIP, comparable health insurance programs for low-income residents, mental health funds, services related to developmental disabilities or severely disabled persons, WIC funds, and state-sponsored pharmaceutical programs.[75] Further research is needed to understand whether overall public health funding levels or specific funding mechanisms are most important in affecting states' ability to enact and implement health-promoting policies for obesity prevention and other chronic diseases.

Between 2006 and 2012, much larger increases in the prevalence of strong policies were observed for CF versus PE at all grade levels. This difference has been noted previously,[35,40] and may be a result of more research- and practice-based evidence on the effectiveness of nutrition-related policies and practices, as well as more federal initiatives targeting the school food environment. Beginning in the 2014-2015 school year, all schools participating in federal meals programs were required to comply with new federal CF standards defined by the United States Department of Agriculture (USDA), known as Smart Snacks, effectively giving all states the highest CF policy score

possible for all grade levels.[104] Nevertheless, regular physical activity has documented benefits for children's health,[105] as well as academic performance,[106] warranting greater policy attention at the state and federal levels. Federal action on PE requirements could reduce disparities across states and grade levels on PE policies, allowing all children to benefit from receiving nationally recommended minimums for time spent in PE.[107]

Limitations

There are several limitations of this study. The cross-sectional design prevents conclusions about the temporality of the relationships between collaboration and policy strength. Many states had already enacted a strong policy before the period in which collaboration was measured. In addition, the definition of strong policies used in this study includes policies with specific, mandated requirements that are lower than nationally mandated standards by Smart Snacks (for CF policies) and nationally recommended guidelines by SHAPE America (for PE policies). This was done because so few states had policies in 2012 that met national recommendations and because previous research using the same definition has found strong policies to be associated with improved student behaviors and in some cases, weight status.[34,35,37,38,86-91]

Relatedly, having a policy codified in law does not necessarily mean it is implemented fully, or even partially. It is likely that states vary with regard to the degree of policy implementation, even if they have similar codified policies. Nevertheless, state policies provide a minimum floor for schools to strive for in practice, and previous research has found that having state policies requiring minimum nutrition standards for CF and minimum PE time requirements is positively associated with school practices and environments and student behavior.[35,83,91]

The small number of observations (N=51) prevented analysis of fully adjusted models controlling for multiple state characteristics simultaneously and examination of possible effect modification, for example, whether collaboration was associated with policy strength only in more disadvantaged states. Furthermore, it is important to note that the data represent a census of states, as opposed to a randomly or otherwise selected sample; however, statistics and confidence intervals are based on random sampling. The

data presented here can still be conceived as resulting from a random process, however, because the process of developing and enacting policies is influenced by a complex set of circumstances that cannot be perfectly reproduced.

A more important issue is the possibility of measurement error in the exposure variables. Collaboration was measured by survey questions answered by "the most knowledgeable state official" on school nutrition or physical education in each state, who may or may not be aware of all collaborative activities occurring. State characteristics were dichotomized based on estimates from the National Survey of Children's Health and the American Community Survey, which have margins of error that could result in states being misclassified as below/above the median. Funding variables were computed by the Trust for America's Health based on review of publicly available documents (e.g., state appropriations bills), which could be incomplete or outdated. Any measurement error that exists in these variables is likely non-differential with respect to the policy outcomes (since these were measured through a scoring system and process that was independent of the assessment of the exposure measures), and therefore any resulting bias would be expected to be in the direction toward the null.

Despite these limitations, this analysis is the first to examine the association between collaborative partnerships and evidence-based obesity prevention policies nationally. It is also among the first to examine state-level correlates of evidence-based policies, which have been shown to be effective in changing student behaviors and weight outcomes.

## Conclusion

In theory, cross-sector collaboration contributes to the adoption and implementation of health promoting policies, yet this study found that having evidence-based CF and PE state policies was not associated with cross-sector collaboration between state agency staff and other organization types. It is not known whether the collaborative partnerships measured by this study were unsuccessful in reaching policy adoption or implementation goals or, alternatively, whether their goals and activities were chosen independently of state policy. As foundations, federal funding agencies, and

national experts urge more collaboration on obesity prevention, more research is needed on the role of collaborative partnerships in state policy activities and the factors that contribute to successful partnership. The large investment of time and resources required for a collaborative approach demands greater research evidence on how to structure and manage collaborative partnerships for the greatest efficiency and effectiveness.

## Study 3: Evaluating Collaborative Structures and Processes: A Mixed Methods Case Study of Safe Routes to School in Minnesota

*Introduction*

Walking or biking to school is associated with greater physical activity and cardiovascular fitness among children;[108,109] however, the proportion of children who actively travel to school has declined from 48% in 1969 to just 13% in 2009.[110] Barriers to active school transportation include schools being located far from where students live, parents' concerns about traffic and neighborhood safety, and lack of direct walking routes and pedestrian infrastructure.[109] Recent efforts in the U.S. and abroad have sought to reduce these barriers through the establishment of Safe Routes to School (SRTS) initiatives, which promote active school transportation through physical infrastructure changes (e.g., sidewalk redesign) and programmatic efforts (e.g., crossing guard programs). Evaluation studies have found that SRTS initiatives have increased students' rates of active school transportation and physical activity[111-113] and decreased students' risk of pedestrian injury.[114] However, not all states in the U.S. have been equally successful in creating and implementing SRTS programs, even with the existence of federal funding.[115] In this study, I present research findings using mixed methods to evaluate Minnesota's efforts to implement and institutionalize SRTS, with a particular focus on the role of collaborative partnerships. Minnesota is a national leader on state policy supporting bicycling and walking and is one of only six states that dedicates state funds for SRTS initiatives.[116]

Cross-sector collaboration has been a crucial element of planning and implementing SRTS programs in the United States because of the range of expertise and authority needed to make environmental and policy changes.[46] Local communities (cities, towns, and counties) developed teams that included professionals from public health, education, city planning, and law enforcement, as well as students, parents, and local school staff, to plan and implement comprehensive SRTS programs. Forming and maintaining such collaborative partnerships requires a substantial investment of time and resources, so evaluating the success of these partnerships is critical to informing wise

investments in future public health initiatives. Summary reports and published case studies have reported activities, strategies, and outcomes of local and statewide partnerships on SRTS and other active living-focused partnerships.[110,117-123] Multi-site evaluation studies have sought to identify characteristics of partnerships that contributed to these outcomes, such as the way the partnership is structured (e.g., which partners are involved, what roles they played, and how their interactions were organized) and the interpersonal and inter-organizational processes in operation (e.g., relationship-building, coordination and leadership, articulating a clear mission and vision, communication, and member engagement).[50,52,124] These latter studies are particularly useful for informing the development of future partnerships because they identify key features of partnership success that can be replicated. All of the existing studies rely on data collected from partnership leaders, staff members, and/or community residents, yet none have explicitly examined whether these participants may have divergent perspectives on the partnership's operations and success.

Research and theory on public health partnerships more generally can also inform the identification of key features of partnership success. For example, frameworks for public health collaboration suggest that partnerships should have members representing many different sectors (breadth), and have close relationships between those members (density), in order to successfully make comprehensive policy and social changes.[67,125] However, research has found that breadth and density are inversely related to one another,[68] implying that partnerships that become too broad may be less effective or efficient because they sacrifice the quality of inter-organizational relationships. The literature also suggests that partnerships with strong, centralized leadership may have more efficient and effective direction and management of partnership activities; however, more decentralized leadership may give member organizations more power to align partnership activities with the needs of the communities they serve.[67,68] Furthermore, the structural and procedural features of partnerships often interact with each other to affect partnership functioning,[52] and some research suggests that certain processes may be more important for certain types of partnership activities or goals.[125]

Two specific theories provide complementary frameworks that can be used to understand SRTS partnerships. Community Coalition Action Theory is a research- and practice-based framework for evaluating inter-organizational collaboration in community coalitions. This theory posits that community coalitions move through stages as their work progresses, with different processes and activities taking place at each stage.[60,77] Structures and processes theorized to affect a coalition's ability to work effectively include open and frequent communication, shared and formalized decision-making processes, conflict management, positive interpersonal relationships, strong leadership, interpersonal and organizational skills, and formalized rules, roles, structures, and procedures.[60] Whereas Community Coalition Action Theory focuses generally on coalitions led by grassroots organizations, Collaborative Governance refers to a model of public administration in which multiple public agencies and levels of government engage with non-governmental actors to achieve a public purpose.[64] Collaborative Governance models also emphasize the iterative nature of collaborative processes. Three interacting components are described that constitute the processes that facilitate the partnership's work: principled engagement (process of defining the work), shared motivation (trust, understanding, commitment), and capacity for joint action (formal and informal rules and procedures, leadership, knowledge, and resources).

The abundance and complexity of the literature in the field can make it challenging to discern the best way to structure a partnership given a specific goal and context. Evaluation studies may be most useful, then, when they evaluate the processes that operate at multiple levels of the partnership (e.g., leaders vs. members) and incorporate constructs from multiple theoretical frameworks to interpret the results. This approach can provide a more comprehensive picture of how theorized features of success operate in practice and offer new insight on how various structures and processes interact.

Minnesota Context

Minnesota is a politically progressive state with a growing minority population. According to the 2010 Census, 85% of the state's population was White and over half (54%) of the states' 5.3 million residents lived in the 7-county metro area surrounding the

Twin Cities of Minneapolis and St. Paul.[126] During the period of this study (2010-2014), the governor was a Democrat. Republicans held majorities in both the Senate and House of Representatives during the 2010-2012 session. In 2012, Democrats regained control of both chambers.[127]

In 2005, the U.S. Congress authorized $612 million in federal funding for SRTS programs to be administered by departments of transportation in all 50 states and the District of Columbia (Pub. L. 109–59). As in other states, the Minnesota Department of Transportation (MnDOT) administered federal funds for SRTS infrastructure and non-infrastructure activities between 2006 and 2012, and continues to administer federal funds for SRTS through the Transportation Alternatives Program. A Steering Committee comprised of stakeholders from public agencies and departments, non-profit organizations, and school officials advised MnDOT in the administration of the program funds.

A unique feature of SRTS work in Minnesota is that the Minnesota Department of Health also funded communities to work on SRTS through state-funded grant programs. The Statewide Health Improvement Program (SHIP) is a competitive grant program established by the state legislature in 2008. SHIP grants were awarded to local public health agencies to work with community partners on policy, systems, and environmental change strategies for obesity and tobacco prevention, including SRTS programs.

In 2010, Minnesota joined the State Network Project, a project in 20 states run by the Safe Routes to School National Partnership and the Robert Wood Johnson Foundation. A non-profit organization housed the Network Coordinator position, which was responsible for developing and coordinating a statewide collaborative partnership to support implementation of SRTS programs, leverage additional resources for SRTS, and advocate for policy change at the state level to institutionalize SRTS.[110] Then in 2012, non-profit organizations began advocating at the state legislature for state funds to be allocated to SRTS programming. The advocacy campaign grew to include over 30 organizations, and became known as the SRTS Coalition. Together, the Steering Committee, Network, and Coalition made up the partnership that coordinated and directed work across the state to implement SRTS programs in communities and advocate

for additional state funding at the legislature.

The partnership was successful in contributing to implementation of SRTS programs across the state and creation one of the first state-funded SRTS programs in the country.[116] As of 2012, Minnesota had obligated over $17 million in federal funds to nearly 200 schools to implement policy, practice, and systems changes supporting SRTS,[128] reaching almost 10% of Minnesota's student population.[129] In 2012, Minnesota enacted a bill creating a state SRTS program, and in 2013 allocated $250,000 per year for non-infrastructure funding, such as planning assistance grants. Then in 2014 the state made a one-time allocation of $1 million for infrastructure projects and doubled the amount of on-going non-infrastructure funding.[130]

Research Aims

Minnesota provides a unique opportunity to evaluate a partnership that successfully implemented and institutionalized SRTS in policy and further our understanding of collaborative processes that may operate at different levels of partnership functioning. This case study used data from a survey and interviews with key stakeholders to describe the structures and processes of a statewide partnership on SRTS in Minnesota that contributed to successful implementation and advocacy on SRTS between 2010 and 2014. This study adds to the existing literature on features of partnership success by focusing on two aims:

> Aim 1: To explore how mixed methods can be used to develop a theoretically informed process to identify and describe the roles of key stakeholders in the partnership (e.g., lead organizations versus member organizations, and from all sectors represented by the partnership).
>
> Aim 2: To examine whether key informants' reports of partnership processes differed based on their role in the partnership.

*Methods*

Participants

In February-March 2015, I invited all SRTS organizational representatives actively participating in the Steering Committee, Network, or Coalition to participate in a web-based social network survey. The coordinators at MnDOT, the Network, and the Coalition provided the names and email addresses of the organizational representatives. Eligibility criteria included active participation in SRTS implementation or advocacy work, defined as attending meetings and/or having direct communication with the coordinators in the past year. Representatives from 80 organizations were invited via email to participate, and 48 responded (60%). In summer 2015, a purposeful sample of 18 key stakeholders was recruited from among the survey respondents to participate in 60-minute, one-to-one interviews. This study is based on analysis of the interview data.

Sample Selection Procedures

The survey results were used to identify a diverse group of key stakeholders who 1) had at least 12 months experience in their current job and 2) represented various roles in the partnership. Individuals who responded to the survey were categorized based on their organization's sector and centrality in the partnership (defined below). Six sectors were represented, including state agencies, non-profit organizations, regional development organizations (established by Minnesota law in 1969 to provide technical assistance, including transportation planning, to local units of government in their region[131]), local/regional public health agencies, schools and school districts, and other governmental entities such as city councils and public works departments.

Centrality is a measure of connectivity that reflects the relative influence of an organization within a social network or partnership.[67] Centrality was measured from participants' responses to a survey question that asked, "From the list, select organizations/programs/departments with which you have an established relationship. Include only organizations/programs/departments with which you interact on Safe Routes to School issues." The list of organizations/programs/departments included all 80 organizations that were invited to participate in the survey, except the respondent's own

organization.

The four respondents with the highest centrality scores corresponded to the SRTS coordinators from MnDOT, the Network, the Coalition, and the Department of Health, and all four were recruited for interviews in order to represent the perspectives of the state-level leaders of the partnership. A second MnDOT staff member was also recruited for an interview after early interviews revealed that this individual played an important role in establishing the SRTS program and Steering Committee. The remaining respondents were selected to represent all six sectors and both more central (highest tertile of centrality) and more peripheral (middle tertile of centrality) membership positions in the partnership (Table 10). When multiple possible participants fulfilled these criteria, I selected respondents that represented diverse regions of the state.

**Table 10. Interview Participants by Sector and Centrality**

| Sector\Centrality | Peripheral Members | Central Members | Lead Organizations |
|---|---|---|---|
| State Agencies | 1 | 1 | 3 |
| Non-Profit Organizations | 1 | 3 | 2 |
| Regional Development Organizations | n.a. | 2 | n.a. |
| Local/Regional Public Health Agencies | 1 | 1 | n.a. |
| Schools/Districts | 1 | 1 | n.a. |
| Other Government Entities | 1 | n.a. | n.a. |
| n.a. indicates that there were no survey responses with that combination of sector and centrality | | | |

Key informants were recruited via email and interviews were conducted by phone or in-person at a convenient location for the participant. One individual declined (overall response rate 95%), and another from the same sector and level of centrality was selected in their place. Participants were offered a $25 gift card to thank them for their participation; many refused the gift card or asked for it to be donated. The University of Minnesota Institutional Review Board exempted this study from human subjects review.

A semi-structured interview guide covered topics including the history and formation of the partnership; participants' individual and organizational role in SRTS; goals, strategies, activities, and processes related to implementation and advocacy; and suggestions/recommendations for Minnesota and other states (see Appendix B). These

questions were developed based on prior research on structural and functional features of public health collaborative partnerships.[52,68]

Analysis

Interviews were audio recorded and transcribed for analysis. I used a two-cycle qualitative coding technique to code the transcripts[132] using NVivo 10 (QSR International Pty Ltd., 2012). In the first cycle, I reviewed the transcripts line-by-line and assigned each comment to one or more codes based on its topic and content. In the second cycle, common codes identified in the first cycle were grouped into broader categories to identify major themes. Throughout the process, the codes and emerging concepts were periodically reviewed, discussed, and refined through biweekly conversations with an expert in qualitative methods, who also reviewed two coded transcripts line-by-line to ensure validity of the coding structure. Next, I reviewed all comments under each code and extracted the main concepts in a written summary with illustrative quotes. Attributes of each interview participant (e.g., organizational sector, centrality) were assigned to the transcripts and frequency and content of comments in each code were compared across strata of these attributes. I identified unique themes that emerged from participants fulfilling different roles in the partnership, as well as crosscutting themes that emerged from participants across all roles.

*Results*

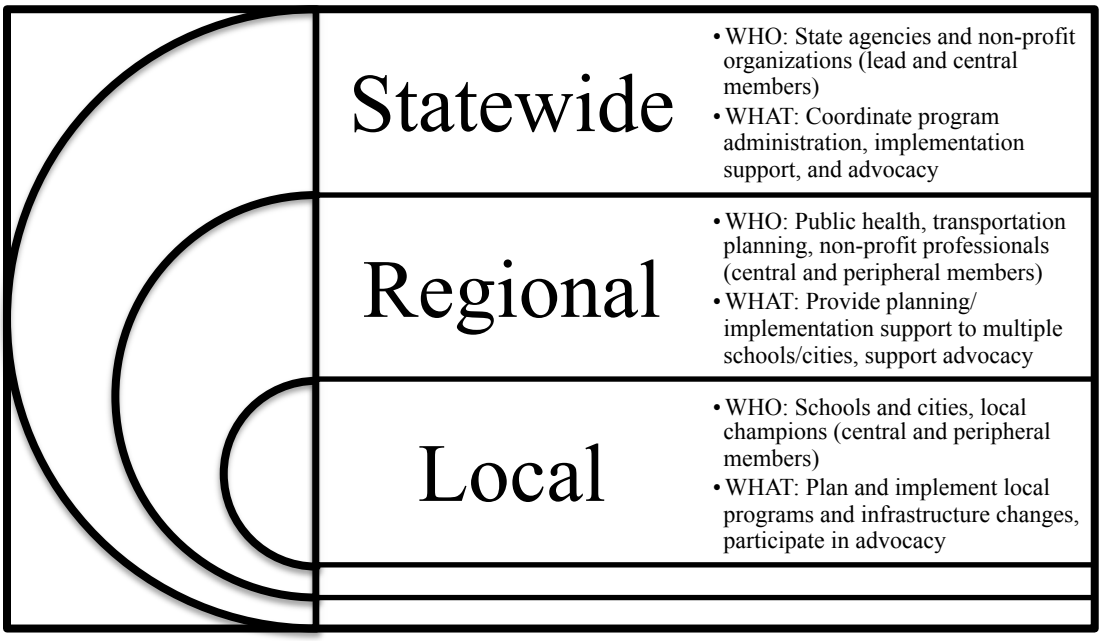
Key findings from the interviews were grouped into the following three main themes: structure, membership, and processes. This section describes these three main themes and their associated sub-themes.

**Structure**

Nearly all participants described themselves as leading and coordinating SRTS activities at some level, although their specific roles varied by the geographic level of their work. Organizations generally worked at the statewide, regional (multiple schools/districts/cities) or local (single school/district/city) level, and specialized in program administration, implementation support, advocacy, and/or direct implementation

(Figure 3). The organizational roles are summarized in this section by geographic level of activity.

**Figure 3. Organizational Roles by Geographic Position, Minnesota Safe Routes to School**




Statewide Leadership and Coordination

At the statewide level, the lead organizations and some central member organizations reported coordinating program administration (i.e., state agencies), implementation support for schools and cities (state agencies and non-profits), or a legislative advocacy campaign (non-profits). The lead organizations reported convening and leading the activities of the Steering Committee, Network, and Coalition, which had separate but complementary functions of program administration, information sharing, and advocacy, respectively.

> *"So the role of the Steering Committee really is to provide advice to MnDOT in terms of [the] activities and investments for Safe Routes to School across the state… The network is really, really*

*good at information sharing… And then the Coalition is really good in terms of rallying broad support for the program and doing what they need to do from a political standpoint…So all these different groups kind of fill their lanes really well." (Participant 27, Lead State Agency)*

Regional Facilitation and Implementation Support

At the regional level, all participants from central and peripheral regional planning organizations, public health agencies, and non-profits described their roles as leading and facilitating community planning processes to develop SRTS plans and providing technical and logistical assistance to multiple schools or cities in their region. One participant explained that this regional leadership model is different from other types of transportation projects in the state, where the state agency is typically the sole leader.

*"We're the ones that are facilitating the meetings for the Safe Routes stuff, and we're the ones that are leading the project and leading the community and the school through the planning process. So we're the ones that are setting that up." (Participant 24, Central Regional Development Organization)*

Some participants working at the regional level also reported supporting the advocacy campaign by providing data and information on local programs, identifying local champions, or directly contacting legislators, as appropriate given their professional role (e.g., public employees are prohibited from lobbying). All participants at this level reported participating in the Network, and many were also members of the Steering Committee.

Local Implementation

At the local level, participants from schools and city government reported working together to plan and implement SRTS programs that often took place on both school and city property. All participants working at the local level were also members of

the Steering Committee and described their role on that body as representing the perspective of the "end-users" of SRTS programs.

> *"On the steering committee, I've been the voice of the schools, honestly. Kind of the front line person that's been doing the work, that has been able to say to the transportation planners, the city planner, the engineers, the people like that, "Well, here's what actually happens in a school." (Participant 13, Central School)*

One participant at the local level also reported engaging in advocacy activities, such as writing letters to the editor and communicating directly with legislators.

**Membership**

Three sub-themes emerged that relate to the partnership members' goals and objectives, engagement in the work of the partnership, and collaborative leadership skills.

One Objective, Many Goals

There was broad agreement among participants that the objective of SRTS collaboration was to increase the number of children walking or biking to school. While all participants reported that their organizations supported this objective, their reasons for doing so differed. All participants from non-profit organizations and local public health agencies described SRTS as a strategy for physical activity promotion and obesity prevention. This theme was less consistent among participants from the other sectors, who described several primary goals of Safe Routes to School, including improving pedestrian and bicyclist safety, improving academic outcomes, and increasing physical activity.

> *"We have different goals, but some of the strategies to achieve our goals are the same. The example I usually give is like, "Well, PCA [Pollution Control Agency], they really care about greenhouse gases, and here we're looking at making sure that people are at a healthy weight or have access to healthy opportunities…But the*

*strategy to achieve all of those would be like, how do we support people in increasing walking and biking?" (Participant 11, Lead State Agency)*

Participants from non-profit organizations who were active in the advocacy campaign reported that articulating the many goals and benefits of SRTS was helpful in gaining the support of a diverse group organizations and crafting their advocacy message for legislators. A few participants from state agencies also reported that the multi-sector benefits of SRTS provided an impetus for agencies to collaborate on program administration.

Member Engagement

Participants from all levels of the partnership described having a personal interest in and passion for SRTS work that motivated them to be involved more closely professionally. This personal and professional commitment was mentioned across all roles in the partnership, and it drove participants to be champions of SRTS in local communities, serve on statewide boards such as the Steering Committee, and testify in front of the state legislature.

*"I'm very passionate about it too….I love doing that stuff, it's really something that I enjoy and you kind of get a chance to get out into the communities and really see what their issues are, and help them address their needs." (Participant 24, Central Regional Development Organization)*

Participants at all levels of centrality also identified having strong local champions as one of the keys to successful implementation and advocacy on SRTS initiatives. Several participants gave examples of communities with a strong local champion, such as a school superintendent or principal, with the authority and interest to organize and sustain community interest to implement the SRTS program even in the

absence of funding for infrastructure changes. They also gave examples of communities where lack of local interest or leadership halted progress on implementation.

> *"That's really the biggest key to our Safe Routes work, we can lead the horse to water, we get all this information out there to all of them, you know, it's just about the connection. Some are like, 'Yeah, let's try this out. Let's do this. We're energized, or at least somebody is energized about it and we'll do it.' And others have been like, 'No thank you.'" (Participant 20, Central Regional Development Organization)*

A few participants noted staff changes as a time when the influence of member engagement on collaboration processes was particularly visible. For example, one participant described how new leadership among some professional associations led them to discontinue their public support of SRTS legislation. Several other participants described how a new SRTS coordinator at MnDOT invigorated collaboration with non-profit organizations and other state agencies and was one factor that led to the development of the Steering Committee.

Collaborative Leadership Skills

Participants at all levels of the partnership described the ability of some partnership members to build interpersonal relationships and facilitate cross-sector collaboration. The Network Coordinator was frequently described as an individual with the right skills to connect individuals and organizations across sectors and regions of the state. Participants described the Coordinator's facilitation of the Network calls as "*welcoming*", "*cultivating a learning atmosphere*", and "*engaging*," and the Coordinator reported being intentional about developing relationships in order to work as an "*enabler…kind of weaving around*" the key players. Several participants at the local and regional level also provided examples of regional leaders' fostering interpersonal relationships that contributed to cross-sector understanding at the local level.

> *"So I ended up developing a really close relationship with the transportation planner at the [regional development organization]…He's someone that I can ask a question of that he's not offended, it's not like I'm trying to teach him, ask him how to do his job, or tell him how to do his job… And then [he] can also explain some of the challenges on [the local engineers'] side that I don't see, that they're not willing to share. (Participant 22, Peripheral Non-Profit)*

## Processes

Four key processes were identified that enabled the partnership to function successfully. They were close relationships among the lead organizations, regional and local capacity building for implementation, local capacity building for advocacy, and information and knowledge sharing.

### Close Relationships among Lead Organizations

Participants from the lead organizations reported that they worked closely together at the state level to direct the activities of the partnership. The Network and Coalition Coordinators also participated in the Steering Committee, which they said helped to align the administration of funds, the implementation support provided through the Network and the advocacy activities of the Coalition. For example, participants from MnDOT and the Department of Health described aligning their agencies' activities and programs and using each agency's respective strengths to more effectively support local communities.

The lead non-profit organizations also reported having a successful history of working together on tobacco policy advocacy, which laid a foundation for collaboration on physical activity promotion and SRTS. Participants from the state agencies reported that they shared information and contacts from their funded communities with the non-profit organizations, who used that information to develop advocacy materials such as facts sheets for each legislative district. All participants from the lead organizations also

described a collaborative climate between them in which individuals worked well together, with each organization having distinct expertise, capacity, and authority that they leveraged to support a common objective.

> *"I think what really worked for us is we all played to our strength and capacity. So I had the time and capacity and expertise to lead on some of the coalition formation and some of the legislative lobbying efforts. The [non-profit] had tremendous local networks that we were able to draw on and pull in, not to mention their expertise in the area of Safe Routes to School. And then [other non-profit] brought their research angle and their ability to help us create these materials to bring to the Capitol." (Participant 10, Lead Non-Profit)*

Regional and Local Capacity Building for Implementation

Participants from the lead organizations described intentionally building regional and local capacity to implement SRTS programs by organizing training workshops and providing funding (through planning assistance grants and SHIP grants) to organizations at the regional level. These organizations would then provide technical assistance and build capacity in local communities to develop SRTS travel plans and implement SRTS programs.

> *"I think what the SHIP funds have done, is they've provided a level of capacity to communities to apply for funds that they might not have had the capacity to apply for previously. So, you know, schools are stretched pretty thin… In some communities, local public health was able to say, 'Well, we can help you with this part, the travel plan, we'll help get funds.'" (Participant 11, Lead State Agency)*

Recipients of the grant funds reported that this model enabled them to dedicate paid staff time to provide technical assistance to schools on planning and implementation, organize regional events, and organize many of the logistical implementation steps that schools did not have the time and resources to do.

> *"We're the ones that drafted the parent letters, we're the ones who talked to the bus systems, made sure they were trained, we're the ones that picked the bus drop off sections. We were the ones that made sure there were enough volunteers there… Now the schools are able to, because we've provided them with all this, they're now able to take that and run with it, and do it themselves."*
> *(Participant 25, Peripheral Local Public Health Agency)*

However, some participants from the regional level reported that the uncertainty of funding from year to year inhibited their ability to develop consistent organizational capacity.

As a result of participating in these planning activities, participants from state agencies reported that many communities went on to develop highly competitive applications for infrastructure grants because their written plans demonstrated clear vision and community capacity to complete the proposed projects. Several participants also provided examples of local communities in which high local capacity could open access to new funding sources or turn a small amount of money into a lot of positive changes in the community.

> *"We did [a plan] a few years ago in [city]. Completed the plan, it was sitting for a little while, we kind of got a meeting back together, I think last July or August to talk about, 'Well, there's this opportunity for money for a trail. We talk about infrastructure in the plan. Do we want to pursue this?' And lo and behold, the city came together, the school district came together…and they got*

*it. They were awarded it." (Participant 20, Central Regional Development Organization)*

The planning process also built community capacity to address other community design issues. After completing SRTS plans, some communities began to think more broadly about other ways their community could change to better support biking and walking. As a result, many of the same stakeholders that worked on SRTS plans began working to make pedestrian and bicycle infrastructure an integrated part of local comprehensive plans.

Local Capacity Building for Advocacy

The lead non-profit organizations noted that the most successful advocacy strategy was getting legislators to hear directly from their constituents, which led them to build local capacity to engage in advocacy activities. They reported using their professional connections, including the members of the Network, to identify local champions from nearly every legislative district in the state who could communicate the importance of SRTS to their legislators and write letters to the editor in local newspapers. Participants from local and regional organizations described how the lead organizations made it easy for them to engage in advocacy activities by scheduling meetings with legislators, providing templates for letters to the editor, and signing them up to testify at the legislature.

"*Staff will contact me and say, 'we really need you to try to get an Op-Ed or an LTE [letter to the editor] in the [local newspaper] next weekend, because this hearing's going to be this date.' [I say,] 'I can get you somebody to sign it; can you get it written, or at least bullet points to me?' And usually within a day or two they can turn that around… But I don't have the time to write it, and to spend going through that extra effort."(Participant 21, Central Non-Profit)*

Information and Knowledge Sharing

Participants at all levels of centrality described the value they derived from meetings and communication with other partnership members, which created connections between and among state, regional, and local participants. The Network conference calls were discussed most frequently as providing a regular communication channel for information and knowledge sharing. Network participants from regional and local organizations reported the most valuable aspects of the calls to be providing a forum for peer-to-peer learning and networking and keeping them abreast of statewide implementation and advocacy activities.

> *"What the Network offers, I think, [is] the opportunity for those who are trying to implement Safe Routes to School to ask their questions of different obstacles or barriers that they come up against, whether it's with community, administration, or elected officials or the school, or even parents sometimes that get involved as volunteers with Safe Routes to School." (Participant 9, Central Non-profit)*

The monthly interval kept communication frequent, and some regional and local participants perceived that this helped strengthen relationships between their organization and organizations at the state level.

From the statewide perspective, participants from both lead and central member organizations reported that the Network calls allowed them to hear about common implementation barriers and challenges, which they could use to shape the types of resources they provided and inform their advocacy messages.

> *"So the Network has been excellent to be that bridge between the Safe Routes Coalition, you know…I'll end up putting together a one page, two page document about a legislative district, here's the*

*activity, [the Coalition Coordinator] can say, that's where they're doing remote drop-offs and how the schools are invested in this, but they're really struggling… because there's not enough resources." (Participant 14, Lead Non-Profit)*

Several participants also noted a connection between information and knowledge sharing and the development of group identity. One lead participant noted how the Steering Committee started out as a room full of people from different backgrounds, and through regular meetings evolved into a collective group with a shared identity.

*"As you can imagine, coalescing a group of people from lots of varied backgrounds together in a room… was a little bit like herding cats. But it's really evolved to the point now where I feel like there's a lot of identity within the group and almost kind of strength and resolve, where they really like providing their input."(Participant 27, Lead State Agency)*

In contrast, another lead participant reported that the Coalition never held phone or in-person meetings, instead communicating via email updates and advocacy alerts, and that this may have contributed to a lack of identity among participants as members of that group.

Several participants from the regional and local levels also noted that the Steering Committee meetings tended to focus on high-level topics such as strategic planning and the types of grants to solicit in a given year, and suggested that the Committee could benefit from having more implementation-focused discussions and experiences, perhaps by visiting sites and/or inviting more participation from schools and local governments.

*"Bring in some folks that really have it together, where it's working, and say, and ask them how to get started, why does this work? Is it a person? Is it a policy? Is it a sidewalk? And also*

*maybe on the other side is, (laughs) Why don't you want to participate in Safe Routes to School?"(Participant 15, Peripheral School)*

Summary of Findings in Relation to Participants' Role

As could be expected, participants provided the most vivid descriptions of their own organization's role in the partnership and how the partnership structure and processes affected their work, thus making each participant's perspective a unique contribution to understanding the partnership as a whole. Both sector and centrality influenced the role an organization played in the partnership, with state agencies from all levels of centrality and lead non-profits working statewide, and both central and peripheral members working at the regional and local levels depending on their sector.

Participants' motivation for participating in the partnership also differed by sector and centrality. Public health-focused organizations (state and local agencies and non-profit organizations), including most lead organizations, were motivated most strongly by physical activity promotion and obesity prevention, while other sectors were motivated by a combination of safety, health, and academic goals. Member engagement appeared to be more a function of individual personalities and interests than sector or centrality. Most participants were willing and able to identify areas of overlapping organizational missions, but a few did not express interest in stretching the scope of their work beyond traditional disciplinary roles.

Some key processes operated at all levels of the partnership (e.g., information and knowledge sharing), while others operated primarily in certain levels (e.g., regional/local capacity building). The same key processes were identified for implementation and advocacy, though the partnership operationalized them differently. For example, the lead organizations built capacity for advocacy by directly providing logistical and technical assistance to local advocates, whereas they built capacity for implementation through a regional support model.

*Discussion*

This study sought to examine whether partnership processes differed based on the role of organizations or individuals in partnerships, and to explore how a mixed methods approach can provide new insight on the operation of theoretical constructs at different levels of participation in partnerships. Findings from this study suggest that Minnesota's SRTS partnership was successful because it engaged passionate and skilled individuals around a common objective, developed structures that facilitated work across several partnership functions and geographic levels, built strong relationships between individuals and organizations, invested in developing regional and local capacity for implementation and advocacy, and established effective methods of sharing information and knowledge. This conclusion generally supports previous findings from both research and theory on collaborative partnerships.[50,52,60,64,67,68,125]

A novel finding that has not previously been reported in prior evaluations of SRTS or active living-focused partnerships is Minnesota's emphasis on regional capacity building as a mid-level leadership strategy to support local implementation. This approach allowed lead organizations to indirectly support a larger number of local programs than they could have supported directly and led to strong relationships between regional and local organizations. Partnerships operating on a large geographic scale (e.g., states, countries) may consider decentralizing some leadership and coordination roles to organizations at a smaller geographic level in order to expand their reach and align partnership activities across many local areas. This conclusion supports prior literature that has identified decentralized leadership as a feature of some successful public health partnerships,[67,68] though none specifically focused on SRTS or active living.

In addition, the use of mixed methods in this study enabled a more nuanced analysis of not only what participants perceived to be key features of success, but also how those perceptions differed by participants' role in the partnership. The partnership worked to empower and support local actors to implement programs and communicate with the legislature. This finding suggests that regional and local organizations played critical roles in developing successful partnership processes and carrying out partnership activities, even though they were not the lead organizations. The regional and local

organizations had the knowledge and expertise to design and implement locally relevant and locally accepted SRTS programs and the power to convince legislators of the importance of SRTS to their communities. Evaluations that only collect data from partnership leaders or key staff may therefore miss important elements of partnership functioning that occurs beneath the core leadership level.

Some features of successful partnerships identified in prior theory and research did not emerge as major themes in this study. For example, Community Coalition Action Theory and Collaborative Governance models posit that formalized structures and shared decision-making procedures facilitate partnership functioning and effectiveness,[60] and the Minnesota partnership did not have formalized decision-making rules, operating procedures, or membership processes. The complicated structure of the Minnesota partnership meant that, in practice, it operated as three interacting but separate partnerships in one (Steering Committee, Network, Coalition), informally coordinated by a small group of lead organizations. This structure may have in fact contributed to the partnership's ability to engage in both statewide implementation support and direct advocacy and lobbying: the clear delineation of roles between the three groups and the informal interactions between them prevented conflicts of interest that could arise when state agencies partner with advocacy organizations. On the other hand, the lack of formal membership processes and outreach/recruitment procedures may have inadvertently left out dissenting voices and communities that were disconnected from the state system. The above theories suggest that more formalized structures are needed as partnerships become larger and more complex. Whether the Minnesota partnership adopts more formal structures and operating processes in the future may depend in part on how the partnerships' goals and activities evolve.

Relatedly, shared decision-making processes may not have been necessary for the partnership at this stage because its work was so narrowly focused on a discrete, clearly defined objective, despite members' varying reasons for supporting that objective. A lesson that can be learned from the Minnesota experience is that starting with a more narrow scope of work may be a good way to establish collaborative relationships and structures. However, previous research suggests that the level of partnership capacity

developed for these early goals may not be sufficient to achieve more comprehensive goals. For example, a study of 48 Midwestern domestic violence prevention partnerships found that measures of strong stakeholder relationships (i.e., frequent communication, shared philosophy, legitimacy) were more strongly correlated with comprehensive systems change goals than they were with coordination or procedural goals.[125] The authors suggest that partnerships that broaden their goals to include more comprehensive systems change may also need to strengthen the relationships and structures of the collaborative. In Minnesota, the partnership may need to revisit the ultimate goals of their collaboration to ensure that the lead organizations and member organizations agree on the future directions of the partnership.

Participants in this study reported initially high member engagement and commitment to the goal of SRTS collaboration, which resulted in their active participation in the partnership. This finding is supported by the Collaborative Governance model, which posits that participants go through an iterative process of defining the work of the partnership and agreeing upon goals and activities, which then enables the organizational members to take joint actions in support of the goals. In contrast, Community Coalition Action Theory considers member engagement to be an outcome or measure of success that leads to greater participation in the future.[60] It is likely that as the Minnesota partnership continues to evolve, initial levels of engagement may either increase or decrease depending on how satisfied the participants are in the way the partnership is organized and managed. Indeed, member engagement in the Coalition may have suffered as a result of infrequent communication among group members, while monthly Network calls promoted stronger connections between members. The iterative nature of collaboration processes such as member engagement suggests that partnerships could benefit from the development of metrics to measure and monitor their processes for continuous improvement over time.

Limitations

Due to the use of purposeful sampling, the perspectives of the participants in this study cannot be generalized to those of other individuals either inside or outside of the

partnership. Participants were also not sampled from the lowest tertile of centrality because the study was interested in describing statewide partnership structures and processes, and participants with so few organizations relationships were unlikely to have in-depth knowledge of statewide activities. Furthermore, only individuals who were actively participating in the partnership were recruited for interviews, which omitted the perspectives of individuals and organizations outside of the partnership. Future research should consider the perspectives of individuals who are interested in SRTS but not currently connected to the statewide partnership to identify barriers to participation. Another limitation of the study is that participants' perspectives reflect their own memories and interpretations of the events and relationships that transpired. Furthermore, community or policy outcomes cannot be attributed directly to the partnership because there is no counterfactual to compare what would have happened if the partnership had not existed or if the key processes identified above had not been present.

## Conclusion

The Minnesota partnership was successful in implementing SRTS programs in nearly 200 communities and advocating for the creation of a new state funding stream to expand and institutionalize SRTS in the state. The key structures and processes identified by this and other studies are likely to contribute to partnership success; however, contextual factors external to the partnership are also likely to affect whether partnerships achieve their goals. This study demonstrated that partnership participants offer unique insights into collaborative processes based on the role they play in the partnership. These findings contribute to our theoretical understanding of collaboration by acknowledging that sophisticated partnerships may operate across several different geographical levels and core functions, and the contributors to success may differ across these levels and functions. Mixed methods approaches provide valuable tools to evaluate how partnership structures and processes may differentially contribute to success across partnership functions, settings, and public health topics.

## Summary and Conclusions

Despite widespread emergence of collaborative partnerships for childhood obesity prevention over the past decade, little research has examined why these partnerships form, how they operate, and what impact they have. These questions are important because collaborative partnerships require a large investment of time and resources, and knowing the circumstances under which these approaches are likely to be successful can provide more informed investment and development of successful partnerships. This dissertation contributes to the literature by examining nationwide trends and correlates of collaboration on school nutrition and physical education (PE) and identifying partnership structures and processes that contributed to implementation and advocacy on Safe Routes to School (SRTS) policy in Minnesota. Together, the three studies suggest that collaborative partnerships are common and under some circumstances, such as SRTS in Minnesota, may contribute to adoption and/or implementation of policies to prevent obesity in schools and the neighborhoods surrounding them.

National analyses showed that collaboration between state agency staff from school nutrition and physical education and other organization types increased between 2000 and 2006, particularly among state agency staff from different school health-related disciplines. Collaboration then decreased or stabilized between 2006 and 2012 for all partners except state departments of agriculture, which may reflect changing priorities and strategies or indicate that a threshold for collaboration breadth had been reached, at which point adding additional members would have little added benefit. This trend may also have been a result of external economic and political factors. The economic recession that began in 2008 had substantial impacts on state budgets, which likely reduced state agencies' capacity to engage large numbers of stakeholders. On the other hand, federal stimulus funding through the American Recovery and Reinvestment Act of 2009 and the CDC's Community Transformation Grants program from 2011-2014 provided new sources of funding to state health departments to bolster their prevention activities during a time of lean state spending. The increase in collaboration with state departments of agriculture may reflect greater regulatory flexibility and funding for farm-to-school programming provided by the 2008 Farm Bill and the 2010 Healthy Hunger-

Free Kids Act. Evidence from the Minnesota experience on SRTS also suggests that funding from the federal government and national non-profits and foundations can spur new and expanded collaboration at the state level, as occurred when Minnesota joined the Robert Wood Johnson Foundation's State Network Project to build partnerships that would support implementation of federal SRTS funding.

Collaboration was not associated with state policy strength on competitive foods and beverages or PE time requirements in 2012. Because collaboration was either constant or decreasing between 2006 and 2012, I could not examine my initial research question, which was whether increases in collaboration were associated with increases in policy strength. Furthermore, having only 51 observations limited the sophistication of methods that I could use and led me to categorize measures of state social and economic characteristics to prevent summarizing over values that were not represented in the data. The cross-sectional analyses I performed were the most appropriate way to analyze these data, but they leave unanswered the question of the impact of collaboration on state policy. The findings suggest no clear associations between collaboration and the strength of state policies, which is not surprising given the many social, economic, and political considerations that affect policy enactment[19,20,80] and the diversity in goals, strategies, and activities of collaborative partnerships, which was not measured on the SHPPS. Minnesota's experience with collaboration on SRTS suggests that collaboration between state agencies and non-profit organizations can lead to effective joint activities on policy implementation and advocacy; however, state agencies are prohibited from engaging in advocacy and lobbying, which underscores the need for careful definition of partnership goals and clear delineation of roles between organizations.

These findings illustrate both the strengths and limitations of using surveillance data to conduct research studies. Few data sources exist that enable examination of how partnerships change over time, particularly at a national level. Surveillance data are usually collected at regular intervals and contain complete (or near complete) data from all units under surveillance, in this case, states. The use of surveillance data in this study provided a nationally representative descriptive analysis of which organizations worked together in each state in the country. However, surveillance data are generally not

collected with the same frequency or intensity as data collected for a specific research question. The SHPPS data would have been more informative if they included measures of the strength or quality of relationships between organization types and the types of joint activities they engaged in.

Instead, the SHPPS data describe the number and types of relationships that exist at the state level on school nutrition and physical education, which provides insight into how our society and government is responding to the societal challenge of childhood obesity. The collaboration variables from the SHPPS may also be used as covariates in future studies investigating the relationship between state policies, state agency implementation support to schools, and student health outcomes such as obesity.

Collaboration and strong policies were both more common in states with higher poverty and higher childhood obesity prevalence. A mixed methods analysis of collaborative partnerships seeking to integrate physical activity into daily life in 25 communities (cities/towns) also found that partnership members reported higher partnership capacity if they were located in the South, and particularly if they worked in more racially diverse and lower income areas.[124] These findings suggest that communities traditionally considered to be low in resources may actually be resource-rich in the form of community identity, strong relationships, and a willingness to work together to address issues of high concern. In Minnesota, member engagement and local champions were identified as keys to the partnership's success; however, other aspects of community capacity, such as technical and logistical tasks, were intentionally built and supported by the partnership. It is likely that community interest and engagement is necessary but not sufficient to result in successful partnerships. Greater collaboration in states with a higher burden of childhood obesity also aligns with theories of partnership development and formation.[60,64]

I hypothesized that greater collaboration would occur in states with greater levels of public health funding and stronger laws governing school nutrition and PE, but the results did not consistently support this hypothesis, and the direction of causality is unclear. Evidence from Minnesota suggests that policy enactment and allocation of funding for childhood obesity prevention initiatives can be both a driver and an outcome

of collaboration. Federal funding for SRTS (which was allocated via a 2005 federal law establishing SRTS programs in all states) provided the impetus for cross-sector collaboration to assist communities with implementation of SRTS programs. As the demand for these funds outpaced their availability, the partnership added advocacy to its list of functions, with the goal of new state policy enactment that would provide state funds to maintain and expand the federally funded program. These feedback loops may explain why no consistent trends were observed between the number of collaborative partners, public health funding levels, and the strength of state policies in cross-sectional analyses using national data.

The use of mixed methods in study 3 provides more comprehensive data and enables a more nuanced analysis of the formation, operations, and outcomes of collaborative partnerships than quantitative analysis of surveillance data. However, single case studies cannot determine the relationship between how a partnership functions and the outcomes it achieves because they lack a comparison group. Unfortunately, much of the evidence of the effectiveness of collaborative partnerships is based on case study designs. The use of comparative case studies, in which several states or communities are purposefully sampled to represent a range of characteristics thought to impact partnership functioning, could address this limitation while preserving the richness of data that results from an in-depth case study approach. Comparative case studies would contribute to our understanding of how collaborative partnerships operate in different settings and which characteristics are found in successful partnerships and lacking in unsuccessful ones.

The use of a collaborative approach to policy making and governance has many benefits, regardless of the success of the collaborative in achieving policy or environmental change. For example, collaborative processes may build community identity, social connectedness, and capacity; enable state and local governments to provide a wider range of technical assistance and support, and provide policy makers with a better understanding of the challenges facing their constituents.[46,60] For this reason, collaborative partnerships are unlikely to be abandoned as a method of addressing complex health and social problems, despite limited evidence that they are more effective than traditional, single-sector approaches. Researchers, funders, and practitioners of

collaboration should therefore focus their efforts on identifying and promoting elements of effective collaboration that can be replicated, rather than debating the merits of collaboration as an approach.

## Bibliography


**1.** Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of childhood and adult obesity in the United States, 2011-2012. *JAMA.* 2014;311(8):806-814.

**2.** Daniels SR, Arnett DK, Eckel RH, et al. Overweight in Children and Adolescents: Pathophysiology, Consequences, Prevention, and Treatment. *Circulation.* 2005;111(15):1999-2012.

**3.** Freedman DS, Mei Z, Srinivasan SR, Berenson GS, Dietz WH. Cardiovascular risk factors and excess adiposity among overweight children and adolescents: The Bogalusa Heart Study. *J Pediatr.* Jan 2007;150(1):12-17 e12.

**4.** Li C, Ford ES, Zhao G, Mokdad AH. Prevalence of pre-diabetes and its association with clustering of cardiometabolic risk factors and hyperinsulinemia among U.S. adolescents: National Health and Nutrition Examination Survey 2005-2006. *Diabetes Care.* Feb 2009;32(2):342-347.

**5.** Guo SS, Chumlea WC. Tracking of body mass index in children in relation to overweight in adulthood. *Am J Clin Nutr.* 1999;70(1):145s-148s.

**6.** Freedman DS, Khan LK, Serdula MK, Dietz WH, Srinivasan SR, Berenson GS. The Relation of Childhood BMI to Adult Adiposity: The Bogalusa Heart Study. *Pediatrics.* 2005;115(1):22-27.

**7.** Bray GA. Medical Consequences of Obesity. *J Clin Endocrinol Metab.* 2004;89(6):2583-2589.

**8.** Kushi LH, Doyle C, McCullough M, et al. American Cancer Society Guidelines on nutrition and physical activity for cancer prevention: reducing the risk of cancer with healthy food choices and physical activity. *CA Cancer J Clin.* Jan-Feb 2012;62(1):30-67.

**9.** Wang YC, McPherson K, Marsh T, Gortmaker SL, Brown M. Health and economic burden of the projected obesity trends in the USA and the UK. *The Lancet.* 2011;378(9793):815-825.

**10.** Yancey A. Social Ecological Influences on Obesity Control: Instigating Problems and Informing Potential Solutions. *Obesity Management.* 2007;3(2):74-79.

**11.** Lytle LA. Examining the etiology of childhood obesity: The IDEA Study. *Am J Community Psychol.* 2009;44(3-4):338-349.

**12.** Sallis JF, Glanz K. Physical Activity and Food Environments: Solutions to the Obesity Epidemic. *Milbank Mem Fund Q.* 2009;87(1):123-154.

**13.** Huang TT-K, Drewnowski A, Kumanyika SK, Glass TA. A Systems-Oriented Multilevel Framework for Addressing Obesity in the 21st Century. *Prev Chronic Dis.* 2009;6(3):A82.

**14.** Finegood DT, Merth TD, Rutter H. Implications of the foresight obesity system map for solutions to childhood obesity. *Obesity (Silver Spring, Md).* Feb 2010;18 Suppl 1:S13-16.

**15.** Institute of Medicine. *Accelerating Progress in Obesity Prevention: Solving the Weight of the Nation.* Washington, DC: The National Academies Press;2012.

**16.** Kahn LK, Sobush K, Keener D, et al. Recommended Community Strategies and Measurements to Prevent Obesity in the United States. *Morb Mortal Weekly Rep.*

2009;58(RR07):1-26.
**17.** Flynn MA, McNeil DA, Maloff B, et al. Reducing obesity and related chronic disease risk in children and youth: a synthesis of evidence with 'best practice' recommendations. *Obes Rev.* Feb 2006;7 Suppl 1:7-66.
**18.** Novak NL, Brownell KD. Role of policy and government in the obesity epidemic. *Circulation.* 2012;126(19):2345-2352.
**19.** Eyler AA, Nguyen L, Kong J, Yan Y, Brownson R. Patterns and predictors of enactment of state childhood obesity legislation in the United States: 2006-2009. *Am J Public Health.* Dec 2012;102(12):2294-2302.
**20.** Boehmer TK, Luke DA, Haire-Joshu DL, Bates HS, Brownson RC. Preventing childhood obesity through state policy. Predictors of bill enactment. *Am J Prev Med.* Apr 2008;34(4):333-340.
**21.** May AL, Kim SA, Sherry B, Blanck HM. Childhood obesity task forces established by state legislatures, 2001-2010. *Prev Chronic Dis.* 2013;10:E144.
**22.** Centers for Disease Control and Prevention (CDC). Vital Signs: Obesity Among Low-Income, Preschool-Aged Children — United States, 2008–2011. *Morb Mortal Weekly Rep.* 2013;62(31):629-634.
**23.** Wen X, Gillman MW, Rifas-Shiman SL, Sherry B, Kleinman K, Taveras EM. Decreasing Prevalence of Obesity Among Young Children in Massachusetts From 2004 to 2008. *Pediatrics.* April 23, 2012 2012.
**24.** Centers for Disease Control and Prevention (CDC). Obesity in K–8 Students — New York City, 2006–07 to 2010–11 School Years. *Morb Mortal Weekly Rep.* 2011;60(49):1673-1678.
**25.** Robert Wood Johnson Foundation. *Declining childhood obesity rates--where are we seeing signs of progress?* Princeton, NJ 2013.
**26.** Pan L, Blanck HM, Sherry B, Dalenius K, Grummer-Strawn LM. Trends in the prevalence of extreme obesity among us preschool-aged children living in low-income families, 1998-2010. *JAMA.* 2012;308(24):2563-2565.
**27.** Kumanyika SK, Brownson RC, Cheadle A. The L.E.A.D. Framework: Using Tools From Evidence-Based Public Health to Address Evidence Needs for Obesity Prevention. *Prev Chronic Dis.* 2012;9:E125.
**28.** Lankford T, Hardman D, Dankmeyer C, Schmid T. Analysis of state obesity legislation from 2001 to 2010. *J Public Health Manag Pract.* May-Jun 2013;19(3 Suppl 1):S114-118.
**29.** Story M, Nanney MS, Schwartz MB. Schools and Obesity Prevention: Creating School Environments and Policies to Promote Healthy Eating and Physical Activity. *Milbank Mem Fund Q.* 2009;87(1):71-100.
**30.** Chriqui JF, Turner L, Taber DR, Chaloupka FJ. Association between district and state policies and US public elementary school competitive food and beverage environments. *JAMA Pediatr.* Aug 1 2013;167(8):714-722.
**31.** Chriqui JF, Pickel M, Story M. Influence of school competitive food and beverage policies on obesity, consumption, and availability: a systematic review. *JAMA Pediatr.* Mar 2014;168(3):279-286.
**32.** Taber DR, Chriqui JF, Chaloupka FJ. State laws governing school meals and disparities in fruit/vegetable intake. *Am J Prev Med.* Apr 2013;44(4):365-372.

**33.** Taber DR, Chriqui JF, Powell L, Chaloupka FJ. Association between state laws governing school meal nutrition content and student weight status: implications for new USDA school meal standards. *JAMA Pediatr.* Jun 2013;167(6):513-519.
**34.** Hennessy E, Oh A, Agurs-Collins T, et al. State-Level School Competetive Food and Beverage Laws are Associated with Children's Weight Status. *J Sch Health.* 2014;84(9):609-616.
**35.** Taber DR, Chriqui JF, Perna FM, Powell LM, Slater SJ, Chaloupka FJ. Association between state physical education (PE) requirements and PE participation, physical activity, and body mass index change. *Prev Med.* Nov 2013;57(5):629-633.
**36.** Robertson-Wilson JE, Dargavel MD, Bryden PJ, Giles-Corti B. Physical activity policies and legislation in schools: a systematic review. *Am J Prev Med.* Dec 2012;43(6):643-649.
**37.** Cawley J, Frisvold D, Meyerhoefer C. The impact of physical education on obesity among elementary school children. *J Health Econ.* Jul 2013;32(4):743-755.
**38.** Taber DR, Chriqui JF, Perna FM, Powell LM, Chaloupka FJ. Weight Status Among Adolescents in States That Govern Competitive Food Nutrition Content. *Pediatrics.* 2012;130(3):437-444.
**39.** Nanney MS, MacLehose R, Kubik MY, Davey CS, Coombes B, Nelson TF. Recommended school policies are associated with student sugary drink and fruit and vegetable intake. *Prev Med.* May 2014;62:179-181.
**40.** Nanney MS, Nelson T, Wall M, et al. State school nutrition and physical activity policy environments and youth obesity. *Am J Prev Med.* Jan 2010;38(1):9-16.
**41.** Riis J, Grason H, Strobino D, Ahmed S, Minkovitz C. State school policies and youth obesity. *Matern Child Health J.* Apr 2012;16 Suppl 1:S111-118.
**42.** Hendriks A-M, Jansen MW, Gubbels JS, De Vries NK, Paulussen T, Kremers SP. Proposing a conceptual framework for integrated local public health policy, applied to childhood obesity - the behavior change ball. *Implement Sci.* 2013;8(1):46.
**43.** Institute of Medicine. *The Future of the Public's Health in the 21st Century.* Washington, DC: The National Academies Press;2002.
**44.** Yee S, Williams-Piehota P, Sorensen A, Roussel A, Hersey J, Hamre R. The Nutrition and Physical Activity Program to Prevent Obesity and Other Chronic Diseases: Monitory Progress in Funded States. *Prev Chronic Dis.* 2006;3(1):77.
**45.** Hersey J, Kelly B, Roussel A, et al. The value of partnerships in state obesity prevention and control programs. *Health Promot Pract.* Mar 2012;13(2):222-229.
**46.** Roussos ST, Fawcett SB. A review of collaborative partnerships as a strategy for improving community health. *Annu Rev Public Health.* 2000;21:369-402.
**47.** Bell J, Cohen L. Convergence Partnership. *National Civic Review.* 2013;102(4):40-42.
**48.** Varda D, Shoup JA, Miller S. A systematic review of collaboration and network research in the public affairs literature: implications for public health practice and research. *Am J Public Health.* Mar 2012;102(3):564-571.
**49.** Adamson K, Shepard D, Easton A, Jones ES. The YMCA/Steps Community

Collaboratives, 2004-2008. *Prev Chronic Dis.* 2009;6(3):A109.
**50.** Litt JS, Reed HL, Tabak RG, Zieff SG, Eyler AA, Lyn R. Active Living Collaboratives in the United States: Understanding Characteristics, Activities, and Achievement of Environmental and Policy Change. *Prev Chronic Dis.* 2013;10:E19.
**51.** Desjardins E, Schwartz AL. Collaborating to combat childhood obesity. *Health Aff (Millwood).* Mar-Apr 2007;26(2):567-571.
**52.** Baker EA, Wilkerson R, Brennan LK. Identifying the role of community partnerships in creating change to support active living. *Am J Prev Med.* Nov 2012;43(5 Suppl 4):S290-299.
**53.** Lyn R, Aytur S, Davis TA, et al. Policy, systems, and environmental approaches for obesity prevention: a framework to inform local and state action. *J Public Health Manag Pract.* May-Jun 2013;19(3 Suppl 1):S23-33.
**54.** Khem R, Davey C, Nanney M. The role of family and community involvement in the development and implementation of school nutrition and physical activity policy. *J Sch Health.* 2015;85(2):90-99.
**55.** Mello M. Legal and policy approaches to the obesity epidemic. *Surg Obes Relat Dis.* Sep-Oct 2012;8(5):507-513.
**56.** Institute of Medicine. *Building public-private partnerships in food and nutrition: Workshop summary.* Washington, DC: The National Academies Press;2012.
**57.** Berry FS, Brower RS, Choi SO, et al. Three Traditions of Network Research: What the Public Management Research Agenda Can Learn from Other Research Communities. *Public Adm Rev.* 2004;64(5):539-552.
**58.** Padgett SM, Bekemeier B, Berkowitz B. Collaborative Partnerships at the State Level: Promoting Systems Changes in Public Health Infrastructure. *J Public Health Manag Pract.* 2004;10(3):251-257.
**59.** Woulfe J, Oliver TR, Zahner SJ, Siemering KQ. Multisector partnerships in population health improvement. *Prev Chronic Dis.* 2010;7(6):104.
**60.** Butterfoss F, Kegler MC. Toward a Comprehensive Understanding of Community Coalitions: Moving from Practice to Theory. In: DiClemente R, Crosby R, Kegler MC, eds. *Emerging Theories in Health Promotion Practice and Research: Strategies for Improving Public Health*. San Francisco, CA: Jossey-Bass; 2009:157-193.
**61.** Bazzoli G, Stein R, Alexander J, Conrad D, Sofaer S, Shortell S. Public-Private Collaboration in Health and Human Service Delivery: Evidence from Community Partnerships. *Milbank Mem Fund Q.* 1997;75(4):533-561.
**62.** Bryson J, Crosby B, Stone M. The Design and Implementation of Cross-Sector Collaborations: Propositions from the Literature. *Public Adm Rev.* 2006;66(Special Issue: Collaborative Public Management):44-55.
**63.** Luke DA, Harris JK. Network analysis in public health: history, methods, and applications. *Annu Rev Public Health.* 2007;28:69-93.
**64.** Emerson K, Nabatchi T, Balogh S. An Integrative Framework for Collaborative Governance. *J Public Adm Res Theory.* 2012;22(1):1-29.
**65.** Fawcett S, Schultz J, Watson-Thompson J, Fox M, Bremby R. Building Multisectoral Partnerships for Population Health and Health Equity. *Prev Chronic*

*Dis.* 2010;7(6):79.
**66.** Mays GP, Scutchfield D. Improving Public Health System Performance Through Multiorganizational Partnerships. *Prev Chronic Dis.* 2010;7(6):88.
**67.** Mays GP, Scutchfield D, Bhandari MW, Smith SA. Understanding the Organization of Public Health Delivery Systems: An Empirical Typology. *Milbank Mem Fund Q.* 2010;88(1):81-111.
**68.** Retrum JH, Chapman CL, Varda DM. Implications of network structure on public health collaboratives. *Health Educ Behav.* Oct 2013;40(1 Suppl):13S-23S.
**69.** Centers for Disease Control and Prevention. *Results from the School Health Policies and Practices Study 2012.* U.S. Department of Health and Human Services;2013.
**70.** Institute of Medicine. *Schools and Health: Our Nation's Investment.* Washington, DC: National Academies Press; 1997.
**71.** Masse LC, Frosh MM, Chriqui JF, et al. Development of a School Nutrition-Environment State Policy Classification System (SNESPCS). *Am J Prev Med.* Oct 2007;33(4 Suppl):S277-291.
**72.** National Cancer Institute. Classification of Laws Associated with School Students. 2016; http://class.cancer.gov/. Accessed 02/04/2016, 2016.
**73.** Child and Adolescent Health Measurement Initiative (CAHMI). NSCH (National Survey of Children's Health) Survey Methodology. 2011; http://childhealthdata.org/learn/NSCH/resources/methods. Accessed Mar 31, 2016.
**74.** U.S. Census Bureau. *A Compass for Understanding and Using American Community Survey Data: What Researchers Need to Know.* Washington, DC: U.S. Government Printing Office;2009.
**75.** Trust for America's Health. *Investing in America's Health: A State-by-State Look at Public Health Funding and Key Health Facts.* Washington, DC: Trust for America's Health;2012.
**76.** Institute of Medicine. *Cross-Sector Response to Obesity: Models for Change. Workshop summary.* Washington, DC: The National Academies Press;2015.
**77.** Kegler MC, Rigler J, Honeycutt S. How does community context influence coalitions in the formation stage? A multiple case study based on the Community Coalition Action Theory. *BMC Public Health.* 2010;10:90.
**78.** Zakocs RC, Edwards EM. What explains community coalition effectiveness?: a review of the literature. *Am J Prev Med.* Apr 2006;30(4):351-361.
**79.** Golden SD, McLeroy KR, Green LW, Earp JA, Lieberman LD. Upending the social ecological model to guide health promotion efforts toward policy and environmental change. *Health Educ Behav.* Apr 2015;42(1 Suppl):8S-14S.
**80.** Cawley J, Liu F. Correlates of state legislative action to prevent childhood obesity. *Obesity (Silver Spring, Md).* Jan 2008;16(1):162-167.
**81.** Boehmer TK, Brownson R, Haire-Joshu DL, Dreisinger ML. Patterns of Childhood Obesity Prevention Legislation in the United States. *Prev Chronic Dis.* 2007;4(3):82.
**82.** Hales D, Stevens J, Murray DM, Taber DR, Roberts A. Identifying state-level policy and provision domains for physical education and physical activity in high

school. *Int J Behav Nutr Phys Act.* 2013;10:86.
**83.** Cradock AL, Barrett JL, Carnoske C, et al. Roles and strategies of state organizations related to school-based physical education and physical activity policies. *J Public Health Manag Pract.* May-Jun 2013;19(3 Suppl 1):S34-40.
**84.** Dietz WH, Solomon LS, Pronk N, et al. An Integrated Framework For The Prevention And Treatment Of Obesity And Its Related Chronic Diseases. *Health Aff (Millwood).* Sep 1 2015;34(9):1456-1463.
**85.** Hersey J, Lynch C, Williams-Piehota P, et al. The association between funding for statewide programs and enactment of obesity legislation. *J Nutr Educ Behav.* Jan-Feb 2010;42(1):51-56.
**86.** Cullen KW, Watson K, Zakeri I. Improvements in Middle School Student Dietary Intake After Implementation of the Texas Public School Nutrition Policy. *Am J Public Health.* Jan 2008;98(1):111-117.
**87.** Cullen KW, Watson KB. The impact of the Texas public school nutrition policy on student food selection and sales in Texas. *Am J Public Health.* Apr 2009;99(4):706-712.
**88.** Woodward-Lopez G, Gosliner W, Samuels SE, Craypo L, Kao J, Crawford PB. Lessons learned from evaluations of California's statewide school nutrition standards. *Am J Public Health.* Nov 2010;100(11):2137-2145.
**89.** Taber DR, Chriqui JF, Powell LM, Chaloupka FJ. Banning all sugar-sweetened beverages in middle schools: Reduction of in-school access and purchasing but not overall consumption. *Arch Pediatr Adolesc Med.* 2012;166(3):256-262.
**90.** Taber DR, Chriqui JF, Chaloupka FJ. Differences in Nutrient Intake Associated With State Laws Regarding Fat, Sugar, and Caloric Content of Competitive Foods. *Arch Pediatr Adolesc Med.* 2012;166(5):452-458.
**91.** Perna FM, Oh A, Chriqui JF, et al. The association of state law to physical education time allocation in US public schools. *Am J Public Health.* Aug 2012;102(8):1594-1599.
**92.** Marlow ML. Determinants of state laws addressing obesity. *Appl Econ Lett.* 2013;21(2):84-89.
**93.** Monnat SM, Lounsbery MA, Smith NJ. Correlates of state enactment of elementary school physical education laws. *Prev Med.* Dec 2014;69 Suppl 1:S5-11.
**94.** Kubik MY, Davey C, Nanney MS, MacLehose RF, Nelson TF, Coombes B. Vending and school store snack and beverage trends: Minnesota secondary schools, 2002-2010. *Am J Prev Med.* Jun 2013;44(6):583-588.
**95.** Larson N, Davey C, Coombes B, Caspi CE, Kubik M, Nanney MS. Food and Beverage Promotions in Minnesota Secondary Schools: Secular Changes, Correlates, and Associations with Adolescents' Dietary Behaviors. *J Sch Health.* 2014;84:777-785.
**96.** Caspi CE, Davey C, Nelson TF, et al. Disparities persist in nutrition policies and practices in Minnesota secondary schools. *J Acad Nutr Diet.* Mar 2015;115(3):419-425 e413.
**97.** Gordon-Larsen P, Nelson MC, Popkin BM. Longitudinal physical activity and sedentary behavior trends: adolescence to adulthood. *Am J Prev Med.* Nov

2004;27(4):277-283.
**98.** Bauer KW, Larson NI, Nelson MC, Story M, Neumark-Sztainer D. Fast food intake among adolescents: secular and longitudinal trends from 1999 to 2004. *Prev Med.* Mar 2009;48(3):284-287.
**99.** Nelson MC, Story M, Larson NI, Neumark-Sztainer D, Lytle LA. Emerging adulthood and college-aged youth: an overlooked age for weight-related behavior change. *Obesity.* Oct 2008;16(10):2205-2211.
**100.** Boles M, Dent C, Fink K, Utermohle C, Fenaughty A. Obesity in K-7 students - Anchorage, Alaska, 2003-04 to 2010-11 school years. *Morb Mortal Weekly Rep.* May 31 2013;62(21):426-430.
**101.** Berger M, Konty K, Day S, et al. Obesity in K-8 students - New York City, 2006-07 to 2010-11 school years. *Morb Mortal Weekly Rep.* Dec 16 2011;60(49):1673-1678.
**102.** Robbins JM, Mallya G, Polansky M, Schwarz DF. Prevalence, disparities, and trends in obesity and severe obesity among students in the Philadelphia, Pennsylvania, school district, 2006-2010. *Prev Chronic Dis.* 2012;9:E145.
**103.** Nanney MS, Davey C. Evaluating the distribution of school wellness policies and practices: a framework to capture equity among schools serving the most weight-vulnerable children. *J Am Diet Assoc.* Sep 2008;108(9):1436-1439.
**104.** United States Department of Agriculture. Smart Snacks in Schools: USDA's "All Foods Sold in Schools" Standards. 2015; http://www.fns.usda.gov/sites/default/files/allfoods_flyer.pdf. Accessed Sep 15, 2015.
**105.** United States Department of Health and Human Services. *Physical Activity Guidelines for Americans.* Washington, DC 2008.
**106.** Castelli D, Glowacki E, Barcelona J, Calvert H, Hwang J. *Active Education: Growing Evidence on Physical Activity and Academic Performance.* Active Living Research;2015.
**107.** SHAPE America (Society of Health and Physical Educators). Physical Education Guidelines. 2016; http://www.shapeamerica.org/standards/guidelines/peguidelines.cfm. Accessed Feb 19, 2016.
**108.** Lee MC, Orenstein MR, Richardson MJ. Systematic review of active commuting to school and children's physical activity and weight. *Journal of Physical Activity and Health.* 2008;5:930-949.
**109.** Davison KK, Werder JL, Lawson CT. Children's Active Commuting to School: Current Knowledge and Future Directions. *Prev Chronic Dis.* 2008;5(3):A100.
**110.** Ping R. *Safe Routes to School State Network Project Phase II: Successes and Lessons Learned (2010-2011 Final Report).* Safe Routes to School National Partnership;2011.
**111.** Stewart O, Moudon AV, Claybrooke C. Multistate Evaluation of Safe Routes to School Programs. *Am J Health Promot.* 2014;38(3 Supplement):S89-S96.
**112.** Chillon P, Evenson KR, Vaughn A, Ward DS. A systematic review of interventions for promoting active transportation to school. *Int J Behav Nutr Phys Act.* 2011;8:10.

**113.** Hoelscher D, Ory M, Dowdy D, et al. Effects of Funding Allocation for Safe Routes to School Programs on Active Commuting to School and Related Behavioral, Knowledge, and Psychosocial Outcomes: Results From the Texas Childhood Obesity Prevention Policy Evaluation (T-COPPE) Study. *Environ Behav.* 2016;48(1):210-229.
**114.** DiMaggio C, Chen Q, Muennig PA, Li G. Timing and effect of a safe routes to school program on child pedestrian injury risk during school travel hours: Bayesian changepoint and difference-in-differences analysis. *Inj Epidemiol.* 2014;1(1):17.
**115.** Cradock AL, Fields B, Barrett JL, Melly S. Program practices and demographic factors associated with federal funding for the Safe Routes to School program in the United States. *Health Place.* Jan 2012;18(1):16-23.
**116.** Lieberman M, Pedroso M, Zimmerman S. *Making Strides: State Report Cards on Support for Walking, Bicycling, and Active Kids and Communities.* Safe Routes to School National Partnership;2016.
**117.** Heinrich KM, Aki NN, Hansen-Smith H, Fenton M, Maddock J. A Comprehensive Multi-Level Approach for Passing Safe Routes to School and Complete Streets Policies in Hawaii. *Journal of Physical Activity and Health.* 2011;8(Suppl 1):S135-S140.
**118.** Dodson EA, Langston M, Cardick LC, Johnson N, Clayton P, Brownson RC. "Everyone should be able to choose how they get around": how Topeka, Kansas, passed a complete streets resolution. *Prev Chronic Dis.* 2014;11:E25.
**119.** Dobson NG, Gilroy AR. From partnership to policy: the evolution of Active Living by Design in Portland, Oregon. *Am J Prev Med.* Dec 2009;37(6 Suppl 2):S436-444.
**120.** Eyler AA, Brownson RC, Doescher MP, et al. Policies related to active transport to and from school: a multisite case study. *Health Educ Res.* Dec 2008;23(6):963-975.
**121.** Atteberry H, Dowdy D, Oluyomi A, Nichols D, Ory MG, Hoelscher DM. A Contextual Look at Safe Routes to School Implementation in Texas. *Environ Behav.* 2016;48(1):192-209.
**122.** Burke NM, Chomitz VR, Rioles NA, Winslow SP, Brukilacchio LB, Baker JC. The path to active living: physical activity through community design in Somerville, Massachusetts. *Am J Prev Med.* Dec 2009;37(6 Suppl 2):S386-394.
**123.** Geraghty AB, Seifert W, Preston T, Holm CV, Duarte TH, Farrar SM. Partnership moves community toward complete streets. *Am J Prev Med.* Dec 2009;37(6 Suppl 2):S420-427.
**124.** Brennan LK, Brownson RC, Hovmand P. Evaluation of Active Living by Design: implementation patterns across communities. *Am J Prev Med.* Nov 2012;43(5 Suppl 4):S351-366.
**125.** Nowell B. Profiling capacity for coordination and systems change: the relative contribution of stakeholder relationships in interorganizational collaboratives. *Am J Community Psychol.* Dec 2009;44(3-4):196-212.
**126.** American Fact Finder. U.S. Census Bureau; 2016. http://factfinder.census.gov. Accessed Mar 3.

**127.** Minnesota Legislative Reference Library. Party Control of the Minnesota Senate, 1951-present. 2016; http://www.leg.state.mn.us/lrl/histleg/caucus?body=s. Accessed Mar 14, 2016.
**128.** Safe Routes to School National Partnership. Safe Routes to School Federal Program - State of the States As of June 30, 2014. 2014; http://saferoutespartnership.org/sites/default/files/pdf/State-of-the-States-June-2014-FINAL.pdf.
**129.** Minnesota Department of Health. *Safe Routes for Healthy Kids: Opportunities for Safe Routes to School (presentation)*. 2010.
**130.** Minnesota Department of Transportation. Safe Routes to School Fall 2014 Grant Updates. 2014; http://www.dot.state.mn.us/saferoutes/grants.html.
**131.** Minnesota Association of Development Organizations. 2016; http://www.mnado.org/. Accessed Mar 14, 2016.
**132.** Saldana J. *The Coding Manual for Qualitative Researchers*. London, UK: Sage Publications; 2009.

## Appendix A. State Policy Scoring Criteria, Classification of Laws Associated with School Students

| Policy | Score | Criteria |
|---|---|---|
| Non-entrée Snacks/Food Items (Competitive Foods)<br><br>Note: Scored separately for requirements in cafeterias, vending machines, and school stores/canteens/snack bars; and for elementary schools, middle schools, and high schools. Standards are identical across locations and grade levels. | **6** | State prohibits the sale or service of [*a la carte (individual, non-entrée) food outside the reimbursable school meal programs during the service of meals in the cafeteria; food through vending; food through school stores, canteens, and snack bars*] ***or*** allows only the following exceptions:<br>Non-entrée food items limited to:<br>• Non-fried fruit (fresh or packed in juice or water), and vegetables, whole grain products, nonfat and low-fat dairy products (nonfat or 1 percent only, flavored or non-flavored) that are 200 calories or less per serving *and*<br>• No more than 35 percent of total calories from fat (with the exception of nut/seed products)<br>• Less than 10 percent calories from saturated fat *and*<br>• Zero trans fat *and*<br>• 35 percent or less by weight of total sugars or 35 percent or less of calories from total sugars (does not apply to dairy or fruit products) *and*<br>• Sodium content 200 mg or less<br>*Note*: Points will apply if state has established a standard that uses a *gram* limit that is comparable to the percent limits identified above for fat, saturated fat, and sugar (i.e., no more than 6 grams of total fat per 150 calorie portion). |
| | **5** | State allows the sale or service of only the following food items in *[location]*:<br>Non-entrée food items limited to:<br>• 200 calories or less per serving *and*<br>• No more than 35 percent of total calories from fat (with the exception of nut/seed products) *and*<br>• No more than 10 percent calories from saturated fat *and*<br>• Zero trans fat *and*<br>• 35 percent or less by weight of total sugars or 35 percent or less of calories from total sugars (does not apply to fruit or dairy) *and*<br>• Sodium content 200 mg or less<br>*Note*: Points will apply if state has established a standard that uses a *gram* limit that is comparable to the percent limits identified above for fat, saturated fat, and sugar (i.e., no more than 6 grams of total fat per 150 calorie portion). |
| | **4** | State mandates nutrition standards for the sale of non-entrée food items in *[location]* that meet or exceed |

| | | |
|---|---|---|
| | | federal dietary guidelines with specified limits on calories *or* fats (saturated or trans) *or* total or added sugar *or* sodium. |
| | **3** | State restricts sale of foods through *[location]* of low nutritive value beyond federal requirements for FMNV but without establishing nutrition standards that meet or exceed federal dietary guidelines. |
| | **2** | State requirement of foods sold through *[location]* is undefined (e.g., "healthy" foods and beverages must be available) or state requires a state agency to develop and adopt nutrition standards applicable to *a la carte* sales/service or other competitive foods. |
| | **1** | State recommends nutrition standards for sold through *[location]*. |
| | **0** | No provision. |
| Beverages<br><br>Note: Scored separately for requirements in cafeterias, vending machines, and school stores/canteens/snack bars; and for elementary schools, middle schools, and high schools. Standards are identical across locations and grade levels. | **6** | State prohibits the sale or service of *[a la carte (individual, non-entrée) beverages outside the reimbursable school meal programs during the service of meals in the cafeteria; beverages through vending; beverages through school stores, canteens, and snack bars] or* allows only the following exceptions:<br>Beverages limited to:<br>• Water without added flavorings, additives or carbonation, *and/or*<br>• Nonfat or 1 percent only, flavored, or non-flavored milk, *and/or*<br>• Other beverages with at least 100 percent fruit/vegetable juice with no added caloric or non-caloric sweeteners, *and/or*<br>• Caffeine-free, with the exception of trace amounts of naturally occurring caffeine substances. |
| | **5** | State allows the sale or service of only the following beverages through *[location]*:<br>Beverages limited to:<br>• Water, ***and/or***<br>• Nonfat or 1 percent only, flavored, or non-flavored milk, ***and/or***<br>• Other beverages with at least 100 percent fruit/vegetable juice with no added caloric sweeteners, ***and/or***<br>• Caffeine-free, with the exception of trace amounts of naturally occurring caffeine substances.<br>Additional beverages allowed with limits on total calories and/or added sugar (would allow for some sports drinks, juice drinks, flavored waters, and diet sodas) |
| | **4** | State mandates nutrition standards for the sale of beverages through *[location]* that meet or exceed federal dietary guidelines with specified limits on calories ***or*** fats (saturated and trans) ***or*** total or |

| | | |
|---|---|---|
| | | added sugar ***or*** sodium ***or*** caffeine. |
| | **3** | State restricts sale of beverages through *[location]* of low nutritive value beyond federal requirements for FMNV but without establishing nutrition standards that meet or exceed federal dietary guidelines. |
| | **2** | State requirement of beverages sold through *[location]* is undefined (e.g., "healthy" foods and beverages must be available) or state requires a state agency to develop and adopt nutrition standards applicable to *a la carte* sales/service or other competitive foods. |
| | **1** | State recommends standards for beverages sold through *[location]*. |
| | **0** | No provision. |
| Physical Education Time Requirements<br><br>Note: Scored separately for elementary schools, middle schools, and high schools. Standards vary by grade level; numbers in brackets refer to minutes for Elementary/Middle/High school level. | **5** | State requires public school districts to provide PE for a minimum of *[150/225/225]* minutes per week (or the equivalent in credit(s) based on the Carnegie unit). |
| | **4** | State requires public school districts to provide PE for a minimum of *[90/150/150]* minutes per week but less than *[150/225/225]* minutes per week (or the equivalent in credit(s) based on the Carnegie unit). |
| | **3** | State requires public school districts to provide PE for a minimum *[60/90/90]* minutes per week but less than *[90/150/150]* minutes per week (or the equivalent in credit(s) based on the Carnegie unit). |
| | **2** | State requires public school districts to provide PE for less than *[60/90/90]* minutes per week or state requires PE without a specified time requirement |
| | **1** | State only recommends a PE time requirement for public school districts or state requirement for physical activity includes an option for PE. |
| | **0** | No PE time requirement or recommendation. |

## Appendix B: Key Informant Interview Guide

Introductory Questions/Background (5 min)

1. What is your position in your organization? What are your job responsibilities?
2. What has been your involvement in Safe Routes to School work in Minnesota?
    a. What brought you to this role?
    b. How long have you been in this role?

History of Safe Routes to School Collaboration (10 min)

3. Tell me about **how your organization first got involved** in the Safe Routes to School Network, Coalition, or Steering Committee.

    a. **Which** of these groups is your organization a member of?

    *b*. What was your (organization's) **motivation** for getting involved?

    *c*. In your understanding, what led to the **formation** of the N/C/SC?

    *PROBES:*

    - *public health concerns*
    - *funding*
    - *history*
    - *politics*

4. How has your organization's involvement in the N/C/SC **changed over time**?

    *PROBES:*

    - *org. representative*
    - *goals*
    - *activities*
    - *strategies*

Outcomes (30 min): I'd like to talk about implementation of Safe Routes to School across the state, since 2005. By implementation, I mean anything related to planning Safe Routes to School programs, applying for funding or awarding funding, and carrying out those plans once funded.

*Note: If a member of more than one group, ask separately for each group.*

5. Tell me about **your organization's** involvement in the implementation of Safe Routes to School. Can you give me a few **examples** of the type of work you do related to implementation?

6. I'm interested in how the Safe Routes to School N/C/SC supported implementation of Safe Routes to School. From your perspective, what were the **key activities** taken by the N/C/SC that were the **most valuable** in terms of supporting implementation?
    a. Do you know how the Safe Routes to School N/C/SC decided to focus on these activities? Can you tell me more about the **agenda-setting** or **decision-making** process of the N/C/SC?
    b. From your perspective, who was **responsible** for overseeing these activities?
    c. What was it about these activities that **made them so valuable**?

*PROBES:*
- *SPECIFIC EXAMPLES*
- *diverse stakeholders*
- *funding and staffing*
- *communication*
- *leadership/ decision-making*
- *politics*
- *other context/history*

7. Which N/C/SC activities were the **least valuable** in supporting implementation?
    a. What was it about these activities that **made them less valuable**?
    b. Do you have any **suggestions** of how the N/C/SC could have been more effective in supporting implementation?
8. Before we move on, is there anything else you'd like to say about what **did or did not work well** in terms of how the N/C/SC worked on implementation?

Outcomes, part 2: Now I'd like to talk about the legislative process that resulted in the adoption of state laws providing funding for Safe Routes to School. In particular, I'd like to focus on the 2013 and 2014 legislative sessions, which were the first to fund Safe Routes to School.

9. What was **your and your organization's** involvement in the legislative process? Can you give me a few examples of the type of work you did related to informing, influencing, or participating in the legislative process?
10. What did your organization **hope to achieve** through the legislative process, as it relates to Safe Routes to School?
    a. Did you perceive any **differences** between your organization's goals and the N/C/SC's goals for the legislative process?
    b. Did you observe any instances where the N/C/SC **resolved differences** between member priorities and goals? Can you tell me more about that?

c. Were there any **shifts in priorities** over time, either within your organization or within the N/C/SC? How did these **arise** and how did the N/C/SC **deal with** them?

11. From your perspective, what were the N/C/SC's **key activities** that were the **most valuable** in terms of influencing the legislative process on Safe Routes to School?
    a. Do you know how the Safe Routes to School N/C/SC decided to focus on these activities? Can you tell me more about the **decision-making** process of the N/C/SC?
    b. From your perspective, who was **responsible** for overseeing these activities?
    c. What was it about these activities that **made them so valuable**?

*PROBES:*

- *SPECIFIC EXAMPLES*
- *diverse stakeholders*
- *funding and staffing*
- *communication*
- *leadership/ decision-making*
- *politics*
- *other context/history*

12. Which N/C/SC activities were the **least valuable** in terms of influencing the legislative process?
    a. What was it about these activities that **made them less valuable**?
    b. Do you have any **suggestions** of how the N/C/SC could have been more effective in the legislative process?
13. Before we move on, is there anything else you'd like to say about what **did or did not work well** in terms of how the N/C/SC worked on the legislative process?

<u>Reflection (15 min)</u>

14. What **advice** do you have for other states and organizations that would like to develop cross-sector partnerships on Safe Routes to School or other topics?
15. What do you see as the **future** of Safe Routes to School work in Minnesota? Where would you like to see the N/C/SC **go next**?
16. **What will it take** for N/C/SC to get there?
17. Is there **anything else** you'd like to share?
18. Is there **anyone else** you think I should talk to?